Entergy

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**Patric W. Conroy**
Manager, Licensing IPEC

April 30, 2006

Re: Indian Point Units 1, 2 & 3
Docket Nos. 50-3, 50-247, 50-286
NL-06-053

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: **Indian Point Nuclear Power Plants Units 1, 2 and 3**
**Annual Radiological Environmental Operating Report for 2005**

Dear Sir:

Enclosed please find one copy of the Indian Point Site Annual Radiological Environmental Operating Report for the period January 1, 2005 to December 31, 2005. No commitments are being made by this report.

This report is submitted in accordance with facility licenses DPR-5, DPR-26, and DPR-64 for Indian Point Unit Nos.1, 2 and 3 respectively.

Should you or your staff have any questions, please contact Mr. Dennis Loope, Radiation Protection Manager at 914-736-8401.

Sincerely,

Patric W. Conroy
Manager, Licensing
Entergy, Indian Point Energy Center

Enclosure

cc: See next page

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cc:

Mr. John P. Boska, Senior Project Manager, NRC NRR DORL
Mr. Samuel J. Collins, Regional Administrator, NRC Region I
NRC Resident Inspector's Office, Indian Point 2
Mr. Paul Eddy, NYS Department of Public Service

# ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

ENTERGY NUCLEAR NORTHEAST

INDIAN POINT NUCLEAR GENERATING STATION
UNITS 1, 2, AND 3

Docket No. 50-003 Indian Point Unit 1 (IP1)
Docket No. 50-247 Indian Point Unit 2 (IP2)
Docket No. 50-286 Indian Point Unit 3 (IP3)

January 1 - December 31, 2005

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# SECTION 1

# EXECUTIVE SUMMARY

## 1.0 EXECUTIVE SUMMARY

This Annual Radiological Environmental Operating Report (AREOR) contains descriptions and results of the 2005 Radiological Environmental Monitoring Program (REMP) for the Indian Point site. The Indian Point site consists of Units 1, 2 and 3. Units 1, 2 and 3 are owned by Entergy Nuclear Northeast. Unit 1 was retired as a generating facility in 1974, and as such, its reactor is no longer operated.

The REMP is used to measure the direct radiation and the airborne and waterborne pathway activity in the vicinity of the Indian Point site. Direct radiation pathways include radiation from buildings and plant structures, airborne material that might be released from the plant, cosmic radiation, fallout, and the naturally occurring radioactive materials in soil, air and water. Analysis of thermoluminescent dosimeters (TLDs), used to measure direct radiation, indicated that there were no increased radiation levels attributable to plant operations.

The airborne pathway includes measurements of air, precipitation, drinking water, and broad leaf vegetation samples. The airborne pathway measurements indicated that there was no increased radioactivity attributable to 2005 Indian Point Station operation.

The waterborne pathway consists of Hudson River water, fish and invertebrates, aquatic vegetation, bottom sediment, and shoreline soil. Measurements of the media comprising the waterborne pathway indicated that there was no adverse radiological impact to the surrounding environment attributed to Indian Point Station operations.

This report contains a description of the REMP and the conduct of that program as required by the IPEC Offsite Dose Calculation Manuals, herein referred to as ODCM. The ODCM designates samples required by Radiological Effluents Controls (RECS) as well as additional samples not required by RECS. This 2005 AREOR also contains summaries and discussions of the results of the 2005 program, trend analyses, potential impact on the environment, land use census, and interlaboratory comparisons.

During 2005, a total of 1347 analyses were performed. Table B-1 presents a summary of the collected sample results. The actual sampling frequency in 2005 was higher than required, due to the inclusion of additional (Non-RECS) sample locations and media.

During the latter part of 2005(Sept-Dec 2005), IPEC identified an onsite Tritium ground water contamination issue in the Unit 2 transformer yard. The exact source is currently unknown and under investigation but may be associated with a small hairline crack discovered on the Unit 2 spent fuel pool shield wall (southern pool wall). As such IPEC has implemented an aggressive onsite and offsite ground water

monitoring program to fully characterized the onsite contamination, to quantify and determine its onsite and offsite radiological impact to the workers, public and surrounding environment, and to aid in identification and ultimate repair of any leaking systems, structures or components affected. To this end, interim changes have been made to the REMP program in the areas of offsite drinking water sampling, special ground and surface water sampling. Section 3 further discusses these augmented programs and there descriptions

In summary, the levels of radionuclides in the environment surrounding Indian Point are significantly less than NRC limits as a result of Indian Point Station operations in 2005. The levels present in the REMP Program for 2005 were within the historical ranges, i.e., previous levels resulting from natural and anthropogenic sources for the detected radionuclides. Further, Indian Point operations in 2005 did not result in approaching any environmental regulatory limits posed by the NRC, or result in any exposure to the public greater than environmental background levels.

# SECTION 2

# INTRODUCTION

## 2.0 INTRODUCTION

### 2.1 Site Description

The Indian Point site occupies 239 acres on the east bank of the Hudson River on a point of land at Mile Point 42.6. The site is located in the Village of Buchanan, Westchester County, New York. Three nuclear reactors, Indian Point Unit Nos. 1, 2 and 3, and associated buildings occupy approximately 35 acres. Unit 1 has been retired as a generating facility. Units 1, 2, and 3 are owned and operated by Entergy Nuclear Northeast.

### 2.2 Program Background

Environmental monitoring and surveillance have been conducted at Indian Point since 1958, which was four years prior to the start-up of Unit 1. The pre-operational program was designed and implemented to determine the background radioactivity and to measure the variations in activity levels from natural and other sources in the vicinity, as well as fallout from nuclear weapons tests. Thus, as used in this report, background levels consist of those resulting from both natural and anthropogenic sources of environmental radioactivity. Accumulation of this background data permits the detection and assessment of environmental activity attributable to plant operations.

### 2.3 Program Objectives

The current environmental monitoring program is designed to meet two primary objectives:

1. To enable the identification and quantification of changes in the radioactivity of the area, and

2. To measure radionuclide concentrations in the environment attributable to operations of the Indian Point site.

To identify changes in activity, the environmental sampling schedule requires that analyses be conducted for specific environmental media on a regular basis. The radioactivity profile of the environment is established and monitored through routine evaluation of the analytical results obtained.

The REMP designates sampling locations for the collection of environmental media for analysis. These sample locations are divided into indicator and control locations. Indicator locations are established near the site, where the presence of environmental radioactivity of plant origin is most likely to be detected. Control locations are established farther away (and upwind/upstream, where applicable) from the site, where the level would not generally be affected by plant discharges. The use of indicator and control

locations enables the identification of potential sources of detected radioactivity, thus meeting one of the program objectives.

Verification of expected radionuclide concentrations resulting from effluent releases attributable to the site is another program objective. Verifying projected concentrations through the REMP is difficult since the environmental concentrations resulting from plant releases are consistently too small to be detected. Plant related radionuclides were detected in 2005, however, residual radioactivity from atmospheric bomb tests and naturally occurring radioactivity were the predominant sources of radioactivity in the samples collected. Nonetheless, analysis of the data verified that plant effluents were far below regulatory limits at environmental levels.

SECTION 3

# PROGRAM DESCRIPTION

## 3.0 PROGRAM DESCRIPTION

To achieve the objectives of the REMP and ensure compliance with the ODCM, sampling and analysis of environmental media are performed as outlined in Table A-1 and described in section 3.3. The Indian Point REMP consists of samples that are required by ODCM and additional samples, Non-RECS, that are not required by ODCM.

### 3.1 Sample Collection

Entergy Nuclear Northeast Nuclear Environmental Monitoring (NEM) personnel perform collection of environmental samples for the Indian Point site.

Assistance in the collection of fish and invertebrate samples was provided by a contracted environmental vendor, Normandeau Associates, Inc.

### 3.2 Sample Analysis

The analysis of Indian Point environmental samples is performed by the James A. Fitzpatrick Nuclear Power Plant (JAFNPP) Environmental Laboratory in Fulton, New York. The JAFNPP lab at Fulton currently analyzes all samples with the exception of environmental TLDs. In addition some water and well samples were analyzed at another EPA certified laboratory. TLDs are analyzed by Framatome.

### 3.3 Sample Collection and Analysis Methodology

#### 3.3.1 Direct Radiation

Direct gamma radiation is measured using integrating calcium sulfate thermoluminescent dosimeters (TLDs), which provide cumulative measurements of radiation exposure (i.e., total integrated exposures in milliroentgen, mR) for a given period. The area surrounding the Indian Point site is divided into 16 compass sectors. Each sector has two TLD sample locations. The inner ring is located near the site boundary at approximately 1 mile (1.6 km). The outer ring is located at approximately 5 miles (8 km) from the site (6.7- 8.0 km), see Figures A-1 and A-2.

An additional TLD sample site is located at Roseton (20.7 miles north ) as a control, and there are eight other TLD sample locations of special interest. In total, there are 41 TLD sample sites, designated DR-1 through DR-41, with two TLDs at each site. TLDs are collected and processed on a quarterly basis. The results are reported as mR per standard quarter (91 days). The mR reported is the average of the two TLDs from each sample site.

### 3.3.2 Airborne Particulates and Radioiodine

Air samples were taken at nine locations varying in distance from 0.28 to 20.7 miles (0.4 to 33 km) from the plant. These locations represent one control and eight indicator locations. The air samples are collected continuously by means of fixed air particulate filters followed by in-line charcoal cartridges. Both are changed on a weekly basis. The filter and cartridge samples are analyzed for gross beta and radioiodine, respectively. In addition, gamma spectroscopy analysis (GSA) is performed on quarterly composites of the air particulate filters. The five required ODCM air sample locations are designated by the codes A-1 through A-5, see Figures A-1 and A-2.

### 3.3.3 Hudson River Water

Hudson River water sampling is performed continuously at the intake structure (ODCM designation Wa1) and at a point exterior to the discharge canal where Hudson River water and water from the discharge canal mix (ODCM designation Wa2), see Figure A-1. An automatic sampling apparatus is used to take representative samples. On a weekly basis, accumulated samples are taken from both sample points. These weekly river water samples are composited for monthly gamma spectroscopy analysis, and quarterly for tritium analysis.

### 3.3.4 Drinking Water

Samples of drinking water are collected monthly from the Camp Field Reservoir (3.4 miles NE, ODCM designation Wb1) and New Croton Reservoir (6.3 Mi SE, Non-RECS designation 8), see Figure A-3. Each monthly sample is approximately 4 liters and is analyzed for gamma-emitting radionuclides, gross beta, and I-131. They are also composited quarterly and analyzed for tritium. In addition, due to the onsite tritium groundwater contamination issue, augmented sampling of this pathway was performed (see 3.3.12.) Sample point AMICUS is a quality control split of a drinking water sample point.

### 3.3.5 Hudson River Shoreline Soil

Shoreline soil samples are collected at three indicator and two control locations along the Hudson River. The designation for the ODCM indicator location is Wc1 and the ODCM control location is designated Wc2, see Figures A-1 and A-2. The remaining two indicator and one control locations are Non-RECS. The samples are gathered at a level above low tide and below high tide and are approximately 2-kg grab samples. These samples are collected at greater than 90 days apart and are analyzed by gamma spectroscopy.

### 3.3.6 Broad Leaf Vegetation

Broad leaf vegetation samples are collected from three locations during the growing season. The designation for the two ODCM indicator locations are Ic1 and Ic2, and the ODCM control location is designated Ic3, see Figures A-1 and A-2. The samples are collected monthly, when available, and analyzed by gamma spectroscopy. These samples consist of at least 1 kg of leafy vegetation and are used in the assessment of the food product and milk ingestion pathways.

### 3.3.7 Fish and Invertebrates

Fish and invertebrate samples are obtained from the Hudson River at locations upstream and downstream of the plant discharge. The ODCM designation for the upstream sample point is Ib2 and the downstream designation is Ib1, see Figures A-1 and A-2. These samples are collected in season or semiannually if they are not seasonal. The fish and invertebrates sampled are analyzed by gamma spectroscopy.

### 3.3.8 Hudson River Aquatic Vegetation (Non-RECS)

During the spring and summer, aquatic vegetation samples are collected from the Hudson River at two indicator locations and one control location, see Figure A-3. Samples of aquatic vegetation are obtained depending on sample availability. These samples are analyzed by gamma spectroscopy.

### 3.3.9 Hudson River Bottom Sediment (Non-RECS)

Bottom sediment and benthos are sampled at four locations, three indicator and one control, along the Hudson River, once each spring and summer, see Figure A-3. These samples are obtained using a Peterson grab sampler or similar instrument. The bottom sediment samples are analyzed by gamma spectroscopy.

### 3.3.10 Precipitation (Non-RECS)

Precipitation samples are continuously collected at one indicator and one control location, see Figure A-3. They are collected in sample bottles designed to hinder evaporation. They are composited quarterly and analyzed for tritium. They are also analyzed by gamma spectroscopy.

### 3.3.11 Soil (Non-RECS)

Soil samples are collected from one control and two indicator locations, see Figure A-3. They are approximately 2 kg in size and consist of about twenty

2-inch deep cores. The soil samples are analyzed by gamma spectroscopy.

### 3.3.12 Augmented Groundwater Sampling

Due to the onsite discovery of tritium and strontium-90 ground water contamination, augmented sampling of (in addition to the REMP) existing drinking water sources and special water sources (non-drinking water sources) was implemented for the latter part of 2005. For drinking water sources, both the Camp Field and Croton Reservoirs were sampled monthly for tritium. Further, near site special waters were sampled monthly for tritium at the Algonquin and Gypsum Outfalls, Rock Quarry and a private abandoned well. In addition, regulatory agencies together with IPEC conducted "split samples" of all of these offsite locations as an independent quality check. Section 4.10 discusses the results for 2005. Additionally more changes will be implemented in 2006 in accordance with NL-06-033-NRC Commitments. Those commitments include routine sampling of new site perimeter well and special strontium sampling of fish and invertebrates and shoreline sediment.

### 3.3.13 Land Use Census

Each year a land use census consisting of milch animal and residence surveys is conducted during the growing season to determine the current utilization of land within 5 miles (8 km) of the site. These surveys are used to determine whether there are changes in existing conditions that warrant changing the sampling program.

The milch animal census is used to identify animals producing milk for human consumption within 5 miles (8 km) of Indian Point. The census consists of visual field surveys of the areas where a high probability of milch animals exists and confirmation through personnel such as feed suppliers who deal with farm animals and dairy associations (See Table B-17). Although there are presently no animals producing milk for human consumption within 5 miles (8 km) of the site, the census is performed to determine if a milk-sampling program needs to be conducted.

A residence census is also performed to identify the nearest residence(s) to the site in each of the 16 sectors surrounding Indian Point. See Table B-18.

ODCM allow sampling of vegetation in two sectors near the site boundary in lieu of a garden census.

## 3.4 Statistical Methodology

There are a number of statistical calculation methodologies used in evaluating the data from the Indian Point REMP. These methods include determination of Lower Limits of Detection (LLD) and Critical Levels ($L_c$), and estimation of

the mean and associated propagated error.

3.4.1 Lower Limit of Detection (LLD) and Critical Level ($L_c$)

The LLD is a predetermined concentration or activity level used to establish a detection limit for the analytical procedures.

The Nuclear Regulatory Commission (NRC) specifies the maximum acceptable LLDs for each radionuclide in specific media. The LLDs are determined by taking into account overall measurement methods. The equation used to calculate the LLD is:

$$LLD = 4.66\ K\ S_b,$$

where: $S_b$ = standard deviation of the background count rate,
and

$K$ consists of variables, which account for such parameters as:
- Instrument characteristics (e.g., efficiency)
- Sample size
- Counting time
- Media density (self-absorption)
- Radioactive decay
- Chemical yield

In the ODCM program, LLDs are used to ensure that minimum acceptable detection capabilities for the counting system are met with specified statistical confidence levels (95% detection probability with 5% probability of a false negative). The LLD is defined as an "a priori" (before the fact) limit representing the capability of a measurement process and not as an "a posteriori" (after the fact) limit for a particular measurement. Table A-2 presents the RETS required LLDs for specific media and radionuclides as specified by the NRC. The LLDs actually achieved are usually much lower since the RETS required LLDs represent the maximum allowed.

The critical level ($L_c$) is defined as that net sample counting rate which has a 5% probability of being exceeded when the actual sample activity is zero (e.g., when counting background only). It is determined using the following equation.

$$L_c = k_a\ S_b\ (1 + T_b/T_s)^{0.5}\ in\ cpm$$

where: $k_a$ = 1.645 (corresponds to a 95% confidence level)
$S_b$ = standard deviation of the background count rate = $(R_b/T_b)^{0.5}$
$R_b$ = background count rate (cpm)
$T_b$ = background count time (min)
$T_s$ = sample count time (min)

For the REMP, net sample results which are less than the $L_c$ value are considered not detected, and the $L_c$ value is reported as the "less than"

value, unless otherwise noted. Values above the $L_c$ are considered positively detected radioactivity in the environmental media of interest (with a 5% chance of false positive).

3.4.2 Determination of Mean and Propagated Error

In accordance with program policy, recounts of positive samples are performed. When the initial count reveals the presence of radioactivity, which may be attributed to plant operations, at a value greater than the $L_c$, two recounts are performed to verify the positive results. The recounts are not performed on; air samples with positive results from gross beta analysis, since the results are always positive due to natural background radioactive material in the air, or tritium in water samples, since an outside contractor provides these activities. When a radionuclide is positively identified in two or more counts, the analytical result for the radionuclide is reported as the mean of the positive detections and the associated propagated error for that mean. In cases where more than one sample result is available, the mean of the sample results and the estimated error for the mean are reported in the Annual Report.

The mean (X) and propagated error (PE) are calculated using the following equations:

$$X = \frac{\sum_{i=1}^{N} X_i}{N}$$

where: $X_i$ = value of each individual observation
$N$ = number of observations

$$PE = \frac{\sqrt{\sum_{i=1}^{N} (ERR_i)^2}}{N}$$

where: $ERR_i$ = 1 sigma error of the individual analysis
$N$ = number of observations

3.4.3 Table Statistics

The averages shown in the summary table (Table B-2) are the averages of the positive values in accordance with the NRC's Branch Technical Position (BTP) to Regulatory Guide 4.8 (Reference 14). Samples with "<" values are not included in the averages.

It should be noted that this statistic for the mean using only positive values

tends to strongly bias the average high, particularly when only a few of the data are measurably positive. The REMP data show few positive values; thus the corresponding means are biased high. Exceptions to this include direct radiation measured by TLDs and gross beta radioactivity in air, which show positive monitoring results throughout the year.

In the data tables B-6 through B-15, values shown are based on the $L_c$ value, unless otherwise noted. If a radionuclide was detected at or above the $L_c$ value in two or more counts, the mean and error are calculated as per Section 3.4.2, and reported in the data table. Values listed as "<" in the data tables are the $L_c$ values for that sample, unless otherwise noted. If multiple counts were performed on a sample and a radionuclide's values are "< $L_c$ " each time, the largest critical level is reported in the data table.

The historical data tables contain the annual averages of the positive values for each year. The historical averages are calculated using only the positive values presented for 1995 through 2004. The 2005 average values are included in these historic tables for purposes of comparison.

## 3.5 Program Units

The Radiological Environmental Monitoring Program uses standard radiological units to express program results. The units and their description are as follows:

*Becquerel* is a measure of radioactive material, abbreviated Bq, from the International System of Units (SI). A Becquerel is one atom disintegration per second. A Becquerel will normally be used with a volume or mass to express the radioactive concentration of some sample material.

*Cubic meter* is a metric volume slightly larger than a cubic yard. It is abbreviated $m^3$ and is used in this report as the unit for the volume of air.

*Curie* is the basic unit used to describe the intensity of radioactivity. The curie is equal to 37 billion disintegrations per second.

*Kilogram* is a metric unit of mass; it is equivalent to 2.2 pounds. Kilogram is abbreviated kg and can be expressed as kg-wet or kg-dry. The wet or dry designation denotes whether the sample is dried or not before it is counted.

*Liter* is a metric unit of volume slightly larger than a quart. It is abbreviated L and is used as the volume for liquids.

*Microsievert (uSv)* is the SI unit for measure of radiation dose to humans. It is equal to 0.1 mrem.

*Millirem* is a measure of radiation dose to humans, abbreviated mrem; it is 1/1000 of a rem. Millirem expressed for some period of time is the dose rate. The millirem is different from the milliroentgen in that the millirem is used for

reporting radiation dose to humans and the milliroentgen is a measure of radiation in the environment or in air. Normal background radiation dose is approximately 300 mrem per year.

*Milliroentgen* is a measure of radiation exposure, abbreviated mR; it is 1/1000 of a roentgen. Milliroentgen expressed for some period of time is the exposure rate.

*Milliroentgen (mR) per standard quarter* is used for direct radiation or Thermoluminescent Dosimeter (TLD) results.

*Picocurie* is a measure of radioactive material, abbreviated pCi. A picocurie is 2.22 atom disintegrations per minute. A picocurie will normally be used with a volume or mass to express the radioactive concentration of some sample material.

*Picocuries per cubic meter* ($pCi/m^3$) is used to express concentration for all air samples.

*Picocuries per kilogram* (pCi/kg) is the expression used to express concentration for REMP vegetation, soil, shoreline soil, and bottom sediment samples.

*Picocuries per liter* (pCi/L) is used to express concentration for liquid samples such as, precipitation, drinking water, and river water samples.

*Standard quarter* is a measure of time (91 days). It is used as the unit of time for expression of mR for the direct radiation measurements from TLDs.

# SECTION 4

## RESULTS AND DISCUSSION

SECTION 4

# RESULTS AND DISCUSSION

## 4.0 RESULTS AND DISCUSSION

The 2005 Radiological Environmental Monitoring Program (REMP) was conducted in accordance with Indian Point's Offsite Dose Calculation Manuals ODCM. The ODCM contain requirements for the number and distribution of sampling locations, the types of samples to be collected, and the types of analyses to be performed for measurement of radioactivity. Additional sampling conducted for the REMP is designated "Non-RECS" because these samples are not required by the ODCM.

The REMP at Indian Point includes measurements of radioactivity levels in the following environmental pathways.

Hudson River-water
Shoreline soil
Fish and invertebrates
Aquatic vegetation (Non-RECS)
Bottom sediment (Non-RECS)
Airborne Particulates and Radioiodine
Precipitation (Non-RECS)
Drinking Water
Terrestrial Broad Leaf Vegetation
Direct Gamma Radiation
Soil (Non-RECS)

An annual land use and milch animal census is also part of the REMP.

To evaluate the contribution of plant operations to environmental radioactivity levels, other man-made and natural sources of environmental radioactivity, as well as the aggregate of past monitoring data, must be considered. It is not merely the detection of a radionuclide, but the evaluation of the location, magnitude, source, and history of its detection that determines its significance. Therefore, we have reported the data collected in 2005 and assessed the significance of the findings.

A summary of the results of the 2005 REMP is presented in Table B-2. This table lists the mean and range of all positive results obtained for each of the media sampled at ODCM indicator and control locations. Discussions of these results and their evaluations are provided below.

The radionuclides detected in the environment can be grouped into three categories: (1) naturally occurring radionuclides; (2) radionuclides resulting from weapons testing and other non-plant related, anthropogenic sources; and (3) radionuclides that could be related to plant operations.

The environment contains a broad inventory of naturally occurring radionuclides which can be classified as, cosmic ray induced (e.g., Be-7, H-3) or geologically derived (e.g., Ra-226 and progeny, Th-228 and progeny, K-40). These radionuclides constitute the majority of the background radiation source and thus account for a majority of the annual background dose detected. Since the detected concentrations of these radionuclides were consistent at indicator and control locations, and unrelated to plant operations, their presence is noted only in the data tables and will not be discussed further.

In addition to the naturally occurring radionuclides discussed above, Cs-137 was detected above background levels in various ODCM and Non-RECS sample media in the vicinity of Indian Point. The sources and significance of the presence of this radionuclide is described in later sections.

The second group of radionuclides detected in 2005 consists of those resulting from past weapons testing in the earth's atmosphere. Such testing in the 1950's and 1960's resulted in a significant atmospheric radionuclide inventory, which, in turn, contributed to the concentrations in the lower atmosphere and ecological systems. Although reduced in frequency, atmospheric weapons testing continued into the 1980's. The resultant radionuclide inventory, although diminishing with time (e.g., through radioactive decay), remains detectable.

In 2005, the detected radionuclide(s) attributable to past atmospheric weapons testing also consisted of Cs-137 in some media. The levels detected were consistent with the historical levels of radionuclides resulting from weapons tests as measured in previous years.

The final group of radionuclides detected through the 2005 REMP comprises those that may be attributable to current plant operations. During 2005, Cs-137 and H-3 were the only potentially plant-related radionuclide detected in some of the samples.

H-3 may be present in the local environment due to either natural occurrence, other man-made sources, or as a result of plant operations. Trace amounts of H-3 were detected in one of four quarterly composite samples from the discharge mixing zone. The levels detected were consistent with historical levels.

Cs-137 and Cs-134 are both produced in and released from fission reactors and were introduced into the environment from the accident at Chernobyl in 1986. Because Cs-134 has a short half-life relative to Cs-137, Cs-134 from Chernobyl is

not likely to be present in 2005. Only Cs-137 is currently found from Chernobyl and also found in weapons test debris.

I-131 is also produced in fission reactors, but can result from non-plant related anthropogenic sources, e.g., medical administrations, such as in four of the last five annual reports.

In the following sections, a summary of the results of the 2005 REMP is presented by sample medium, and the significance of any positive findings discussed. It should be noted that naturally occurring radionuclides are omitted from the summary table (Table B-2) and further discussion.

## 4.1 Direct Radiation

The environmental TLDs used to measure the direct radiation were TLDs supplied and processed by Framatome. The laboratory uses a Panasonic TLD system. In 2005, the TLD program produced a consistent picture of ambient background radiation levels in the vicinity of the Indian Point Station. A summary of the annual TLD data is provided in Table B-2 and all the TLD data are presented in Tables B-3, B-4 and B-5. TLD sample site DR-40 is the control site for the direct radiation (DR) series of measurements.

Table B-3 provides the quarterly and annual average reported doses in mR per standard quarter for each of the direct radiation sample points, DR-1 through DR-41. The table also provides the sector for each of the DR sample points. Table B-4 provides the mean, standard deviation, minimum and maximum values in mR per standard quarter for the years 1999 through 2004. The 2005 means are also presented in Table B-4. Table B-5 presents the 2005 TLD data for the inner ring and outer ring of TLDs.

The 2005 mean value for the direct radiation sample points was 14.1 mR per standard quarter. The mean value for the period 1999 through 2004 was 14.2 mR per standard quarter. At those locations where the 2005 mean value was higher, they are within historical bounds for the respective locations.

The DR sample locations are arranged so that there are two concentric rings of TLDs around the Indian Point site. The inner ring (DR-1 to DR-16) is close to the site boundary. The outer ring (DR-17 to DR-32) has a radius of approximately 5 miles from the three Indian Point units. The results for these two rings of TLDs are provided in Table B-5. The annual average for the inner ring was 14.1 mR per standard quarter and also average for the outer ring was 14.1 mR per standard quarter. The control location average for 2005 was 15.9 mR per standard quarter.

Table C-1 and Figure C-1 present the 10-year historical averages for the inner and outer rings of TLDS. The 2005 averages are consistent with the historical data. The 2005 and previous years' data show that there is no measurable direct radiation in the environment due to the operation of the Indian Point site.

## 4.2 Airborne Particulates and Radioiodine

An annual summary of the results of the 2005 air particulate filter and charcoal cartridge analyses is presented in Table B-2. As shown, there were no radionuclides detected in the air attributable to plant operations.

The results of the analyses of weekly air particulate filter samples for gross beta activity are presented in Table B-6, and the results of the gamma spectroscopy analyses of the quarterly composites of these samples are in Table B-7.

Gross beta activity was found in air particulate samples throughout the year at all indicator and control locations. The average gross beta activity for the eight indicator air sample locations was 0.015 $pCi/m^3$ and the average for the control location was 0.016 $pCi/m^3$. The activities detected were consistent for all locations, with no significant differences in gross beta activity in any sample due to location. Gamma spectroscopy analyses of the quarterly composite air samples showed that no reactor-related nuclides were detected and that only naturally-occurring radionuclides were present at detectable levels.

The mean annual gross beta concentrations and Cs-137 concentrations in air for the past 10 years are presented in Table C-2. From this table and Figure C-2, it can be seen that the average 2005 gross beta concentration was consistent with historical levels. Cs-137 has not been detected since 1987. This is consistent with the trend of decreasing ambient Cs-137 concentrations in recent years.

The charcoal cartridge analytical results are presented in Table B-8. "Less than" values are presented as sample critical level ($L_c$). There was no I-131 detected (LLD = 0.07 $pCi/m^3$) in the charcoal cartridge samples, which is consistent with historical trends.

From the data, it can be seen that no airborne radioactivity attributable to the operation of Indian Point was detected in 2005.

## 4.3 Hudson River Water

A summary of the radionuclides detected in the Hudson River water is contained in Table B-2. Data resulting from analysis of monthly Hudson River water samples for gamma emitters, and H-3 analysis of quarterly composites, are presented in Tables B-9 and B-10, respectively.

No radionuclides other than those that are naturally occurring and tritium were detected in the Hudson River Water samples. Tritium, whose presence may or may not be attributable to plant operations, has been detected in the past as depicted in Table C-3, and was detected in one of four samples from the discharge canal at 618 ± 130 pCi/l, slightly above $L_c$ (413 pCi/l). These tritium levels are well below the required LLD of 3000 pCi/L. Additionally, table C-3 indicates the absence of Cs-137 which is consistent with historical data .

## 4.4 Drinking Water

The annual program summary table (Table B-2) contains a summary of the 2005 drinking water sample analysis results. Results of the gamma spectroscopy analyses of the monthly drinking water samples are in Table B-11 and results of tritium analysis of quarterly composites are in Table B-12. Other than naturally occurring radionuclides, no radionuclides were detected in drinking water samples.

A summary and illustration of historic trends of drinking water are provided in Table C-4 and Figure C-4, respectively. An examination of the data indicates that operation of the Indian Point units had no detectable radiological impact on drinking water.

## 4.5 Hudson River Shoreline Soil

A summary of the radionuclide concentrations detected in the shoreline soil samples is contained in Table B-2. Table B-13 contains all the results of the gamma spectroscopic analyses of the shoreline soil samples.

In addition to the naturally occurring nuclides, Cs-137 was identified in the Hudson River shoreline soil samples in 2005. Cs-137 was detected in four out of ten samples from indicator locations. Cs-137 was detected at the control locations in two out of four samples. The average concentration for the indicator locations was 155 pCi/kg-dry with a maximum concentration of 173 pCi/kg-dry. The control locations had positive samples indicating an average of 104 pCi/kg-dry and a maximum of 173 pCi/kg-dry.

An historical look at Cs-137 detected in shoreline soil at indicator and control locations can be viewed in Table and Figure C-5. Cs-137 has been and continues to be present in this media, both at indicator and control locations,

at a consistent level over the past ten years, and is likely due to legacy contamination from weapons fallout.

## 4.6 Broad Leaf Vegetation

Table B-2 contains a summary of the broad leaf vegetation sample analysis results. All the data from analysis of the 2005 samples are presented in Table B-14. Analyses of broad leaf vegetation samples revealed only naturally occurring nuclides. Historically, Cs-137 has been detected in both control and indicator broad leaf vegetation.

Table C-6 contains a summary and Figure C-6 an illustration, of the broad leaf vegetation analysis results for the past 10 years. The detection of low levels of Cs-137 is consistent with the sporadic detection at both indicator and control locations of relatively low concentrations for the past ten years.

## 4.7 Fish and Invertebrates

A summary of the fish and invertebrate sample analysis results is presented in Table B-2. Table B-15 contains the results of the analysis of all fish and invertebrate samples for 2005. None of the indicator samples revealed radionuclide concentrations greater than $L_c$ values. Only naturally occurring nuclides were detected. A summary of historical fish and invertebrate analytical data is presented in Table C-7 and illustrated in Figure C-7. Data are consistent with historical trends.

## 4.8 Additional Media Sampling

Although not required by the RECS, analyses were performed on aquatic vegetation, Hudson River bottom sediment, soil, precipitation samples, and various other special water samples. A summary of the analytical results obtained is presented in Table B-16. As shown by these data, the radionuclides detected were consistent with their respective historical levels. Since these samples were not required by the ODCM, individual tables and graphs are not presented for the data.

Cs-137 was detected in one of five indicator samples in aquatic vegetation and zero of five control location samples.

Precipitation samples were analyzed for H-3 (tritium) and plant-related nuclides at two locations. No tritium or other plant related nuclides were detected at either location. Historically, tritium has been detected in precipitation at both indicator and control locations.

The Algonquin Outfall, Gypsum Plant Stream, Verplanck-5$^{th}$ Street Well, and

Trap Rock Quarry samples were analyzed for tritium and plant-related nuclides. The samples did not show any tritium or other plant-related nuclides. The Non-RECS sample location of Algonquin Outfall was designated in 1996 and the other special water samples were designated late in 2003

The results from the Non-RECS sampling show that the main detected anthropogenic activity is Cs-137, which is found at both indicator and control locations. The Non-RECS sample data corroborate the ODCM sample data in determining that the operation of the Indian Point station in 2005 had no detectable adverse radiological impact on the environment.

## 4.9 Land Use Census

Environmental Monitoring Land Use Census
Methodology:

A comprehensive survey of the of the 5 mile (8 kilometer) area surrounding the Indian Point Site was conducted during the 2005 Spring, Summer and Fall months in accordance with the ODCM Section D 3.5 Radiological

Visual inspections were made of the 5-mile area around the Indian Point Site during routine sample collections and emergency plan equipment inspections in the area throughout the year.

Obtained information from the New York Agricultural Statistic Service on milching animals within the 5-mile area surrounding Indian Point Energy Center.

An extensive land survey was conducted of the 5-mile area in an attempt to identify new residential areas, commercial developments and to identify milch animals in pasture. Previous locations were visited and verified by dispatching Nuclear Environmental Technicians to the various locations.

Note: This was done while performing quarterly environmental badge change out and field inspections through out the 4 surrounding counties.

- Orange County was surveyed during through the summer and fall.
- Rockland County was surveyed during summer and fall.
- Putnam County was surveyed during the and summer and fall.
- Westchester County was surveyed during the summer and summer and fall.

Note: An aerial survey was not conducted of the 5-mile area this year.

Results:
A census was performed in the vicinity of Indian Point in 2005. This census consisted of a milch animal and a residence census. Results of this census are presented in Tables B-17 and B-18.

The results of the 2005 census were generally same as the 2004 census results. There were no animals producing milk for human consumption found within 5 miles (8 km) of the plant or listed in the New York Agricultural Statistic Service. The second part of this census revealed that the nearest residences are located 0.44 miles (0.71 km) ESE and 0.73 miles (1.13 km) S of the plant. The 2005 land use census indicated there were no new residences that were closer in proximity to IPEC. NEM performed a complete nearest residence survey with updated distances.

The Indian Point REMP does not include a garden census. ODCM allows the sampling of broad leaf vegetation in two sectors at the site boundary in lieu of performing a garden census. Analysis results are discussed in section 4.6 and presented in Table B-14, Table C-6 and Figure C-6.

## 4.10 Tritium Investigation Results.

All water samples associated with the augmented offsite sampling showed no detectable levels of tritium, strontium-90 or other isotopes that were distinguishable from natural background levels related to nuclear power plant operations. Samples were counted at the JAF offsite environmental laboratory and some samples cross-checked with a third party independent laboratory. Further, regulatory agencies' sample results, which conducted split samples offsite, also showed no detection of plant related isotopes which were distinguishable from natural background levels for tritium or strontium-90. Accordingly, for this public dose pathway or offsite environmental impact assessment, all samples continue to show radioactivity levels that were indistinguishable from background radiation levels from natural occurring radionuclide's or legacy environmental contamination from weapons fallout.

## 4.11 Conclusion

The Radiological Environmental Monitoring Program is conducted each year to determine the radiological impact of Indian Point operations on the

environment. The preceding discussions of the results of the 2005 REMP reveal that operations at the station did not result in an adverse impact on the environment.

The results of the 2005 REMP also revealed that the impact on the environment of fallout from previous atmospheric weapons testing and Chernobyl continues to represent the greatest long-term radiological environmental impact from anthropogenic sources. The 2005 REMP results demonstrate the relative contributions of different radionuclide sources, both natural and anthropogenic, to the environmental concentrations. Overall, doses to humans are much more significant from non-plant related sources than those associated with plant operations.

SECTION 5

# REFERENCES

## 5.0 REFERENCES


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# APPENDIX A

## ENVIRONMENTAL SAMPLING AND ANALYSIS REQUIREMENTS

# APPENDIX A

Environmental media are sampled at the locations specified in Table A-1 and shown in Figures A-1, A-2, and A-3. The samples are analyzed according to criteria established in the ODCM. These requirements include: methods of sample collection; types of sample analysis; minimum sample size required; lower limit of detection, which must be attained for each medium, sample, or analysis type, and environmental concentrations requiring special reports.

Table A-1 provides the sampling station number, location, sector, distance from Indian Point, ODCM designation and sample type. Non-RECS samples are also listed but have no ODCM designation code. This table gives the complete listing of sample locations used in the 2005 REMP.

Three maps are provided to show the locations of REMP sampling. Figure A-1 shows the sampling locations within two miles of Indian Point. Figure A-2 shows the sampling locations within ten miles of Indian Point. Figure A-3 shows the Non-RECS sample locations within ten miles of Indian Point.

The ODCM required lower limits of detection for Indian Point sample analyses are presented in Table A-2. These required lower limits of detection are not the same as the lower limits of detection or critical levels actually achieved by the laboratory. The laboratory's lower limits of detection and critical levels must be equal to or lower than the required levels presented in Table A-2.

Table A-3 provides the reporting level for radioactivity in various media. Sample results that exceed these levels and are due to plant operations require that a special report be submitted to the NRC.

In addition to the sampling outlined in Table A-1, there is the environmental surveillance requirement that an annual land use and milch animal census be performed. See Tables B-17 and B-18 for the milch animal and land use census.

## TABLE A-1

## INDIAN POINT REMP SAMPLING STATION LOCATIONS

| SAMPLING STATION | RECS SAMPLE DESIGNATION | LOCATION | DISTANCE | SAMPLE TYPES |
|---|---|---|---|---|
| 3 | DR8 | Service Center Building | Onsite - 0.35 Mi (SSE) at 158° | Direct Gamma |
| 4 | A1<br>A1 | Algonquin Gas Line | Onsite - 0.28 Mi (SW) at 234° | Air Particulate, Radioiodine |
| 5 | A4<br>A4<br>DR10 | NYU Tower | Onsite - 0.88 Mi (SSW) at 208° | Air Particulate, Radioiodine, Direct Gamma |
| 7 | Wb1 | Camp Field Reservoir | 3.4 Mi (NE) at 51° | Drinking Water |
| 8 | NR | New Croton Reservoir | 6.3 Mi (SE) at 124° | Drinking Water |
| 9 | Wa1 | Plant Inlet (Hudson River Intake)* | Onsite - 0.16 Mi (W) at 273° | HR Water |
| 10 | Wa2<br>NR | Discharge Canal (Mixing Zone) | Onsite - 0.3 Mi (WSW) at 249° | HR Water, HR Bottom Sediment |
| 14 | DR7 | Water Meter House | Onsite - 0.3 Mi (SE) at 133° | Direct Gamma |
| 17 | NR<br>NR<br>NR | Off Verplanck | 1.5 Mi (SSW) at 202.5° | HR Aquatic Vegetation, HR Shoreline Soil, HR Bottom Sediment |
| 20 | DR38 | Cortlandt Yacht Club (AKA Montrose Marina) | 1.5 Mi (S) at 180° | Direct Gamma |
| 22 | NR<br>NR | Lovett Power Plant | 1.6 Mi (WSW) at 244° | Air Particulate, Radioiodine |
| 23 | NR<br>A5<br>A5<br>DR40<br>Ic3<br>NR<br>Ib2 | Roseton* | 20.7 Mi (N) at 357° | Precipitation, Air Particulate, Radioiodine, Direct Gamma, Broad Leaf Vegetation, Soil, Fish & Invertebrates |
| 25 | Ib1 | Downstream | Downstream | Fish & Invertebrate |
| 27 | NR<br>NR<br>DR41 | Croton Point | 6.36 Mi (SSE) at 156° | Air Particulate, Radioiodine, Direct Gamma |
| 28 | NR<br>DR4<br>NR<br>NR | Lent's Cove | 0.45 Mi (ENE) at 069° | HR Shoreline Soil, Direct Gamma, HR Bottom Sediment, HR Aquatic Vegetation |
| 29 | NR<br>NR<br>DR39 | Grassy Point | 3.37 Mi (SSW) at 196° | Air Particulate, Radioiodine, Direct Gamma |
| 33 | DR33 | Hamilton Street (Substation) | 2.88 Mi (NE) at 053° | Direct Gamma |

* = Control location
HR = Hudson River
NR = non ODCM
R/S = Reuter Stokes

## TABLE A-1

## INDIAN POINT REMP SAMPLING STATION LOCATIONS

| SAMPLING STATION | RECS SAMPLE DESIGNATION | LOCATION | DISTANCE | SAMPLE TYPES |
|---|---|---|---|---|
| 34 | DR9 | South East Corner of site | Onsite - 0.52 Mi (S) at 179° | Direct Gamma |
| 35 | DR5 | Broadway & Bleakley Avenue | Onsite - 0.37 Mi (E) at 092° | Direct Gamma |
| 38 | DR34 | Furnace Dock (Substation) | 3.43 Mi (SE) at 141° | Direct Gamma |
| 44 | NR<br>NR<br>NR | Peekskill Gas Holder Bldg | 1.84 Mi (NE) at 052° | Precipitation, Air Particulate, Radioiodine |
| 50 | Wc2 | Manitou Inlet* | 4.48 Mi (NNW) at 347° | HR Shoreline Soil |
| 53 | Wc1<br>DR11 | White Beach | 0.92 Mi (SW) at 226° | HR Shoreline Soil, Direct Gamma |
| 56 | DR37 | Verplanck - Broadway & Sixth Street | 1.25 Mi (SSW) at 202° | Direct Gamma |
| 57 | DR1 | Roa Hook | 2 Mi (N) at 005° | Direct Gamma |
| 58 | DR17 | Route 9D - Garrison | 5.41 Mi (N) at 358° | Direct Gamma |
| 59 | DR2 | Old Pemart Avenue | 1.8 Mi (NNE) at 032° | Direct Gamma |
| 60 | DR18 | Gallows Hill Road & Sprout Brook Road | 5.02 Mi (NNE) at 029° | Direct Gamma |
| 61 | DR36 | Lower South Street & Franklin Street | 1.3 Mi (NE) at 052° | Direct Gamma |
| 62 | DR19 | Westbrook Drive (near the Community Center) | 5.03 Mi (NE) at 062° | Direct Gamma |
| 64 | DR20 | Lincoln Road - Cortlandt (School Parking Lot) | 4.6 Mi (ENE) at 067° | Direct Gamma |
| 66 | DR21 | Croton Avenue - Cortlandt | 4.87 Mi (E) at 083° | Direct Gamma |
| 67 | DR22 | Colabaugh Pond Road - Cortlandt | 4.5 Mi (ESE) at 114° | Direct Gamma |
| 69 | DR23 | Mt. Airy & Windsor Road | 4.97 Mi (SE) at 127° | Direct Gamma |
| 71 | DR25 | Warren Ave - Haverstraw | 4.83 Mi (S) at 188° | Direct Gamma |
| 72 | DR26 | Railroad Avenue & 9W - Haverstraw | 4.53 Mi (SSW) at 203° | Direct Gamma |
| 73 | DR27 | Willow Grove Road & Captain Faldermeyer Drive | 4.97 Mi (SW) at 226° | Direct Gamma |
| 74 | DR12 | West Shore Drive - South | 1.59 Mi (WSW) at 252° | Direct Gamma |
| 75 | DR28 | Palisades Parkway | 4.65 Mi (NW) at 310° | Direct Gamma |
| 76 | DR13 | West Shore Drive - North | 1.21 Mi (W) at 276° | Direct Gamma |
| 77 | DR29 | Palisades Parkway | 4.15 Mi (W) at 272° | Direct Gamma |
| 78 | DR14 | Rt. 9W across from R/S #14 | 1.2 Mi (WNW) at 295° | Direct Gamma |

* = Control location
HR = Hudson River
NR = non ODCM
R/S = Reuter Stokes

## TABLE A-1

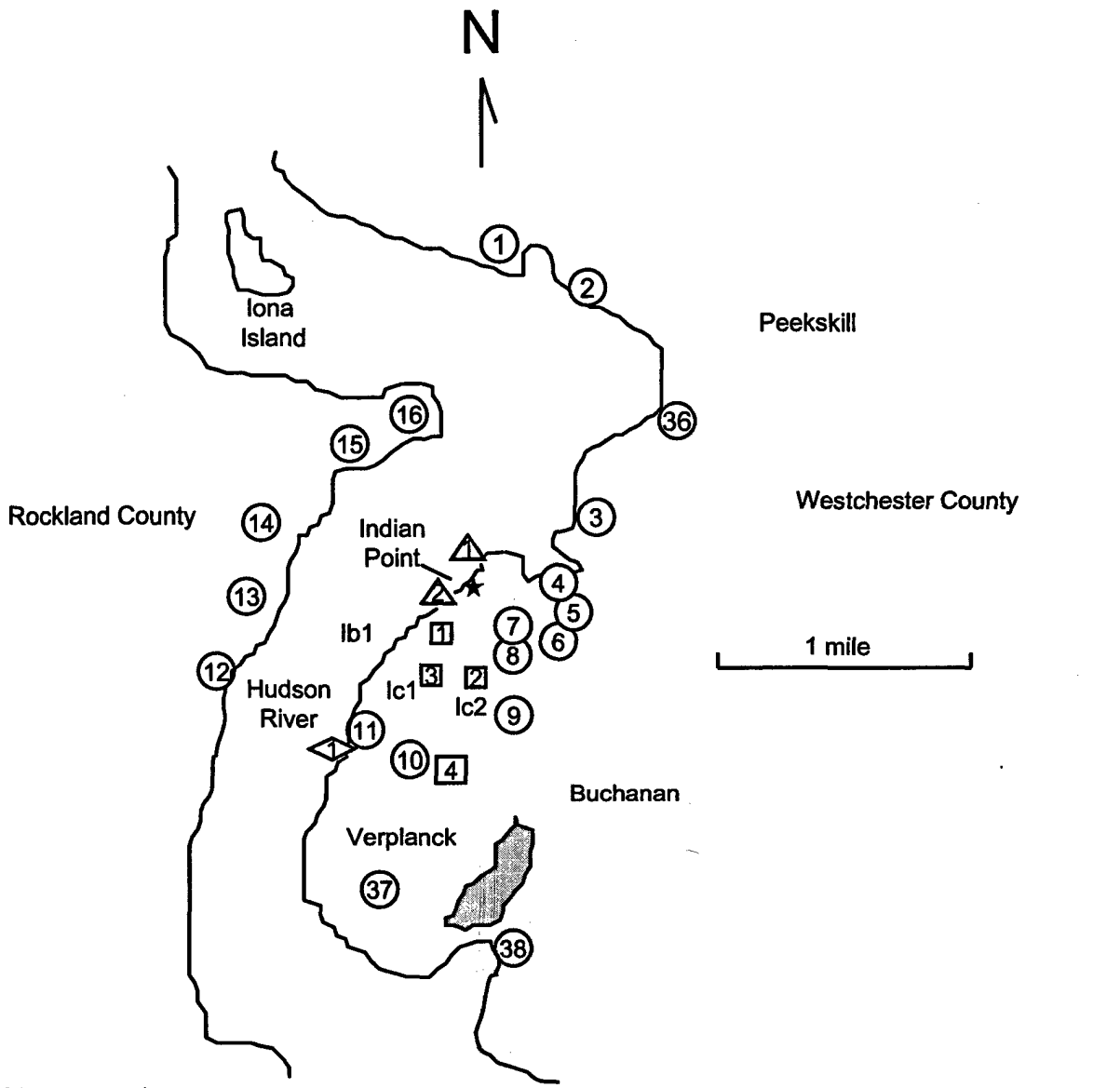
## INDIAN POINT REMP SAMPLING STATION LOCATIONS

| SAMPLING STATION | RECS SAMPLE DESIGNATION | LOCATION | DISTANCE | SAMPLE TYPES |
|---|---|---|---|---|
| 79 | DR30 | Anthony Wayne Park | 4.57 Mi (WNW) at 296° | Direct Gamma |
| 80 | DR15 | Route 9W South of Ayers Road | 1.02 Mi (NW) at 317° | Direct Gamma |
| 81 | DR31 | Palisades Pkwy - Lake Welch Exit | 4.96 Mi (WSW) at 255° | Direct Gamma |
| 82 | DR16 | Ayers Road | 1.01 Mi (NNW) at 334° | Direct Gamma |
| 83 | DR32 | Route 9W - Fort Montgomery | 4.82 Mi (NNW) at 339° | Direct Gamma |
| 84 | NR<br>NR<br>NR | Cold Spring * | 10.88 Mi (N) at 356° | HR Aquatic Vegetation,<br>HR Shoreline Soil,<br>HR Bottom Sediment |
| 88 | DR6 | R/S Pole #6 | 0.32 Mi (ESE) at 118° | Direct Gamma |
| 89 | DR35 | Highland Ave & Sprout Brook Road (near rock cut) | 2.89 Mi (NNE) at 025° | Direct Gamma |
| 90 | DR3 | Charles Point | 0.88 Mi (NE) at 047° | Direct Gamma |
| 92 | DR24 | Warren Road - Cortlandt | 3.84 Mi (SSE) at 149° | Direct Gamma |
| 94 | A2<br>A2<br>Ic2<br>NR | IPEC Training Center | Onsite-<br>0.39 Mi (S) at 193° | Air Particulate,<br>Radioiodine,<br>Broadleaf Vegetation,<br>Soil |
| 95 | A3<br>A3<br>Ic1<br>NR | Meteorological Tower | Onsite -<br>0.46 Mi (SSW) at 208° | Air Particulate,<br>Radioiodine,<br>Broadleaf Vegetation,<br>Soil |
| 99 | NR | Algonquin Outfall | Onsite - 0.34 Mi (SW) at 237° | Special Water |
| 100 | NR | Gypsum Plant Outfall | Onsite - 0.34 Mi (SW) at 237° | Special Water |
| 101 | NR | 5th Street Well - Verplanck | 1 .3 Mi (S) at 202° | Special Water |
| 102 | NR | Trap Rock Quarry | 0.7 Mi (SSW) at 208° | Special Water |

* = Control location
HR = Hudson River
NR = non ODCM
R/S = Reuter Stokes

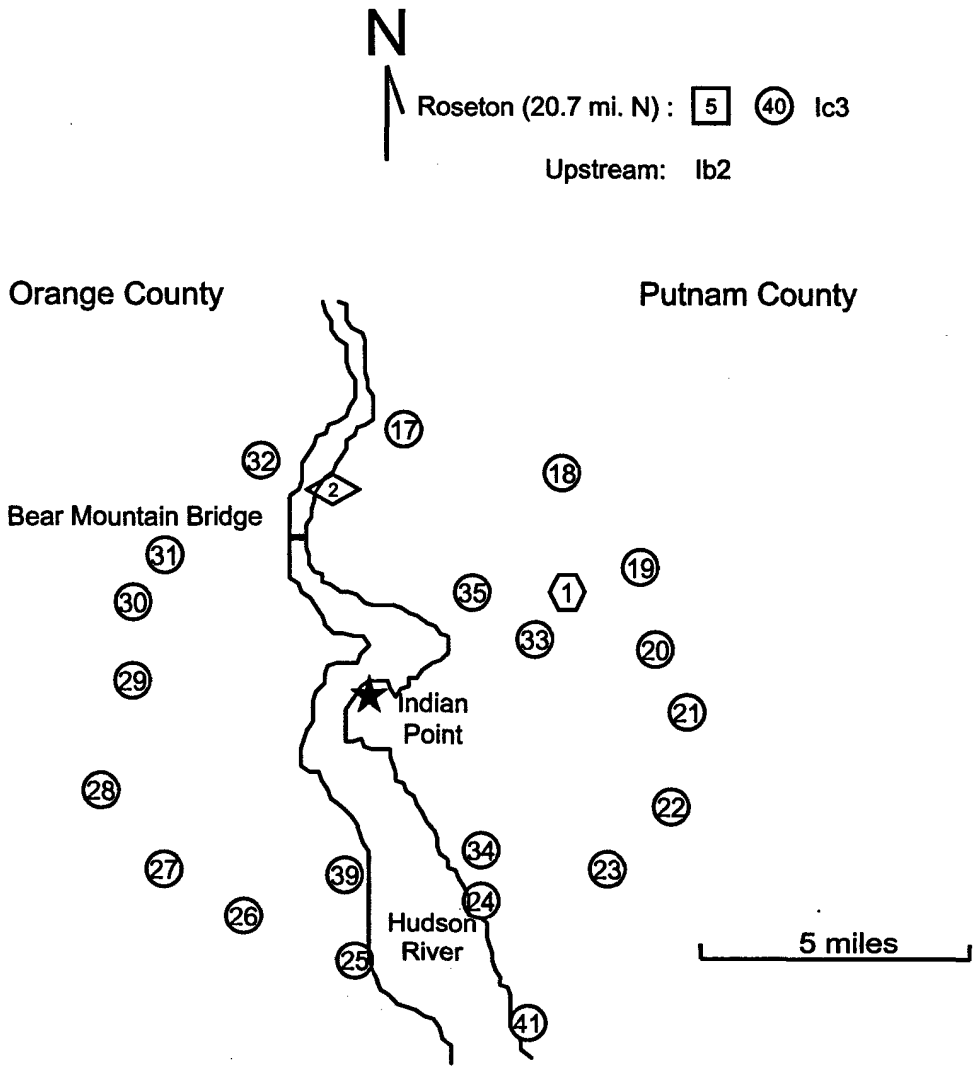
## FIGURE A-1

## SAMPLING LOCATIONS
## Within Two Miles of Indian Point



## FIGURE A-2

## SAMPLING LOCATIONS
## Within 10 Miles of Indian Point



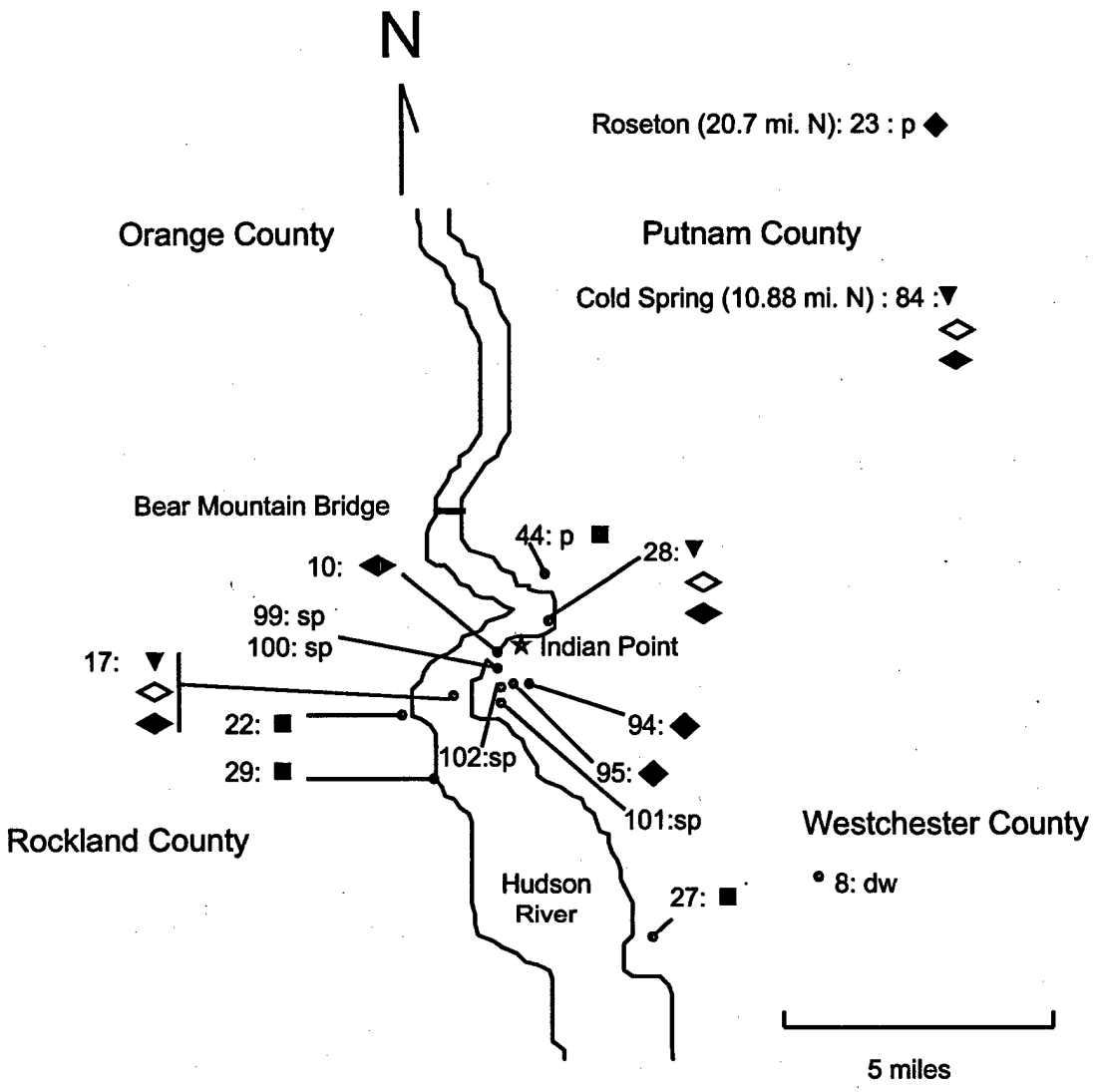

Key:

- ○ - Direct Radiation Sample Location DR#
- □ - Air Particulate & Radioiodine A#
- ◇ - HR Shoreline Sediment Wc#
- ⬡ - Waterborne: Drinking Wb#

lc3 - Broadleaf Vegetation
lb2 - Fish and Invertebrates (where available upstream)

**FIGURE A-3**

**SAMPLING LOCATIONS**
**Non-RECS Sampling Locations**




Key:
- ■ - Air Particulate & Radioiodine
- ▼ - Aquatic Vegetation
- ◆ - HR Bottom Sediment
- p - Precipitation
- ◇ - HR Shoreline Sediment
- ◆ - Soil
- sp - Special Water
- dw – Drinking Water

## TABLE A-2

## LOWER LIMIT OF DETECTION (LLD) REQUIREMENTS FOR ENVIRONMENTAL SAMPLE ANALYSIS [a] [b]

| ANALYSIS | WATER (pCi/L) | AIRBORNE PARTICULATES OR GASES ($pCi/m^3$) | FISH (pCi/kg, wet) | MILK (pCi/L) | FOOD PRODUCTS (pCi/kg, wet) | SEDIMENT (pCi/kg, wet) |
|---|---|---|---|---|---|---|
| Gross β | 4 | 0.01 | | | | |
| H-3 | 2000 [c] | | | | | |
| Mn-54 | 15 | | 130 | | | |
| Fe-59 | 30 | | 260 | | | |
| Co-58 | 15 | | 130 | | | |
| Co-60 | 15 | | 130 | | | |
| Zn-65 | 30 | | 260 | | | |
| Zr-Nb-95 | 15 | | | | | |
| I-131 | 1 [d] | 0.07 | | 1 | 60 | |
| Cs-134 | 15 | 0.05 | 130 | 15 | 60 | 150 |
| Cs-137 | 18 | 0.06 | 150 | 18 | 80 | 180 |
| Ba-La-140 | 15 | | | 15 | | |

[a] This list does not mean that only these nuclides are to be considered. Other identifiable peaks shall also be analyzed and reported in the Annual Radiological Environmental Operating Report.

[b] Required detection capabilities for thermoluminescent dosimeters used for environmental measurements are given in Regulatory Guide 4.13 (Reference 27).

[c] LLD for drinking water samples. If no drinking water pathway exists, a value of 3000 pCi/L may be used.

[d] LLD for drinking water samples. If no drinking water pathway exists, a value of 15 pCi/L may be used.

## TABLE A-3

## REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

| ANALYSIS | WATER (pCi/L) | AIRBORNE PARTICULATES OR GASES ($pCi/m^3$) | FISH (pCi/kg, wet) | MILK (pCi/L) | FOOD PRODUCTS (pCi/kg, wet) |
|---|---|---|---|---|---|
| H-3 | 20000 [a] | | | | |
| Mn-54 | 1000 | | 30000 | | |
| Fe-59 | 400 | | 10000 | | |
| Co-58 | 1000 | | 30000 | | |
| Co-60 | 300 | | 10000 | | |
| Zn-65 | 300 | | 20000 | | |
| Zr-Nb-95 | 400 | | | | |
| I-131 | 2 [b] | 0.9 | | 3 | 100 |
| Cs-134 | 30 | 10 | 1000 | 60 | 1000 |
| Cs-137 | 50 | 20 | 2000 | 70 | 2000 |
| Ba-La-140 | 200 | | | 300 | |

[a] For drinking water samples. This is the 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/L may be used.

[b] If no drinking water pathway exists, a value of 20 pCi/L may be used.

# APPENDIX B

## RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM RESULTS SUMMARY

## APPENDIX B

### B.1 2005 Annual Radiological Environmental Monitoring Program Summary

The results of the 2005 radiological environmental sampling program are presented in Tables B-2 through B-16. Table B-2 is a summary of the ODCM samples and Table B-16 is a summary of the Non-RECS samples. The format of these summary tables conforms to the reporting requirements of the ODCM, NRC Regulatory Guide 4.8 (Reference 4), and NRC Branch Technical Position to Regulatory Guide 4.8 (Reference 14). In addition, the data obtained from the analysis of all the individual ODCM samples are provided in Tables B-3 through B-15.

REMP samples were analyzed by various counting methods as appropriate. The methods are; gross beta, gamma spectroscopy analysis, liquid scintillation, and TLD processing. Gamma spectroscopy analysis was performed for the following radionuclides; Be-7, K-40, Mn-54, Co-58, Co-60, Fe-59, Zn-65, Zr-95, Nb-95, Ru-103, Ru-106, I-131, Cs-134, Cs-137, Ba/La-140, Ce-141, Ce-144, Ra-226 and Ac/Th-228. Radiochemical (I-131) and tritium analyses were performed for specific media and locations as required in the ODCM.

### B.2 Land Use Census

In accordance with Sections 4.11.B of the ODCM, a land use census was conducted to identify the nearest milch animal and the nearest residence. The results of the milch animal and land use censuses are presented in Tables B-17 and B-18, respectively. In lieu of identifying and sampling the nearest garden of greater than $50m^2$, at least three kinds of broad leaf vegetation were sampled near the site boundary in two sectors and at a designated control location (results are presented in Table B-14).

### B.3 Sampling Deviations

During 2005, environmental sampling was performed for six media types required by ODCM, five other media types and direct radiation. A total of 1347 were obtained. Of the scheduled samples, 97.9% were collected and analyzed for the program. Sampling deviations are summarized in Table B-1; discussions of the reasons for the deviations are provided in Table B-1a for air samples, B-1b for TLDs, and B-1c for other environmental media.

### B.4 Analytical Deviations

There were no analytical deviations for 2005.

### B.5 Special Reports

No special reports were required under the REMP.

# TABLE B-1

## SUMMARY OF SAMPLING DEVIATIONS
## 2005

| MEDIA | TOTAL SCHEDULED SAMPLES | NUMBER OF DEVIATIONS* | SAMPLING EFFICIENCY % | REASON FOR DEVIATION |
|---|---|---|---|---|
| **MEDIA** | | | | |
| PARTICULATES IN AIR | 477 | 12 | 97.5 | See Table B-1a |
| CHARCOAL FILTER | 477 | 12 | 97.5 | See Table B-1a |
| TLD | 164 | 0 | 100.0 | |
| HUDSON RIVER WATER | 32 | 2 | 93.8 | See Table B-1c |
| DRINKING WATER | 48 | 1 | 97.9 | See Table B-1c |
| SHORELINE SOIL | 10 | 0 | 100.0 | |
| BROAD LEAF VEGETATION | 54 | 0 | 100.0 | |
| FISH & INVERTEBRATES | 14 | 0 | 100.0 | |
| **SUBTOTALS** | 1276 | 27 | 97.9 | |
| **NON-ODCM MEDIA** | | | | |
| AQUATIC VEGETATION | 10 | 1 | 90.0 | See Table B-1c |
| HUDSON RIVER BOTTOM SEDIMENT | 10 | 0 | 100.0 | |
| SOIL | 3 | 0 | 100.0 | |
| PRECIPITATION | 8 | 0 | 100.0 | |
| SPECIAL WATER SAMPLES | 40 | 1 | 97.5 | See Table B-1c |
| **SUBTOTALS** | 71 | 2 | 97.2 | See Table B-1c |
| **OVERALL TOTALS** | 1347 | 29 | 97.8 | |

TOTAL NUMBER OF ANALYSES REPORTED = 1318

* Samples not collected or unable to be analyzed.

## TABLE B-1a / B-1b/B-1c

| TABLE B-1a<br>2005 Air Sampling Deviations | | |
|---|---|---|
| **STATION** | **WEEK** | **PROBLEM / ACTIONS TO PREVENT RECURRENCE** |
| lovett power plant | week 4 | The volume on the sample was low due to power outage at the site The time meter indicates 2 and 1/2 days. CR-IP2-2005-00358 |
| GRASSY POINT | Week 11 | The air sampler was not running on Monday. The breaker was Tripped some time early Saturday morning. We lost 51 hours of Sample this week. The power was restored at 0900 Monday |
| Algonquin | Week 14 | We found that the power too the air sampler was out and by the hour meter it was off from 0630 on 4/2/5. There was a black out test that morning and the breaker did not reset. The power was restored and the sampler started at 1300 on 4/7/5.CR 2005-0136 |
| Met tower | Week 18 | The air sampler had lost power some time during the week for 26 hours The flow was good and the power was normal when we changed out the sample. CR 2005-01681 |
| Algonquin | Week 20 | The GFI was tripped and by the hour meter it had tripped at 1430 on Friday 5/13/5 I reset the GFI and it started up.CR 2005 1915 |
| Algonquin | Week 26 | We found the door on Algonquin air sample station open and the pump was not running. Attemps to restart the pump tripped the GFI. The pump ran for 107.5 hours out of 144 hours. We replaced the pump and wrote CR 2005-02660 |
| Algonquin | Week 28 | The air sample at Algonquin was found not running with the GFI tripped. The sample ran for 82 hours from 8:40 AM Tuesday 7/5/5 until Friday at 6:40 PM. We reset the GFI and the air sample was left running. Wrote CR-IP2-2005-02892 |
| Algonquin | Week 37 | The air sample at Algonquin was found not running with the GFI tripped. The sample ran for 82.5 hours from 8:45 AM Tuesday 9/6/5 until Friday at 7:15 PM. We reset the GFI and the air sample was left running.On 9/14/5 NEM replaced the GFI with a new one a |
| Lovett | week 45 | The air sample at Lovett Power Plant was not running. There was no power to the air sample. We lost 72 hours of sample. I got the operator to reset the breaker. The plant is in an outage. Wrote C.R.-IP2-2005-04537 |
| Roseton | Week 45 | The air sample at Roseton was not running. The power was out at the location.We had about 48 hours of sample. Power was not restored to that location so we had to move the air sample to a different location on the Roseton site. |
| Lovett | Week 46 | The air sample lost 42 hours some time during the week. It was running when NEM collected the sample. |
| NYU | week 50 | The air sample was not running. The pump was seized and we also had a problem with the power. We replaced the pump and rebuilt the Air sample station.wo IP2-05-12035 |

## TABLE B-1a / B-1b/B-1c

| TABLE B-1b<br>2005 TLD Deviations | | |
|---|---|---|
| STATION | QUARTER | PROBLEM / ACTIONS TO PREVENT RECURRENCE |
| None | NONE | NONE |
| | | |

| TABLE B-1c<br>2005 Other Media Deviations | | |
|---|---|---|
| STATION | SAMPLE SCHEDULE | PROBLEM / ACTIONS TO PREVENT RECURRENCE |
| Hudson River Intake | Week 1 | There was no water in the sample collection bucket.CR-IP2-2005-00084<br>NEM took a grab sample on 1/7/5 Replaced sampler on 1/12/5 |
| Hudson River Intake | Week 3 | There was no water in the sample collection container. The sample tube was frozen.<br>NEM took a grab sample and relocated the heat trace tube.<br>All this week the weather was well below freezing.<br>CR-IP2-2005-00308 |
| DRINKING WATERS | week 6 | The drinking waters was not counted for I-131. The submittal forms did not request it to be counted for I-131 The lab tried to count for I-131 and they counted for 55 hrs but could not get LLD |
| Verplank/Cold Spring | week 24 | Unable two get aquatic vegetation It is not growing yet. CR 2005 2456 |
| 5 th street well | Week 37 | We were uable to get a sample from the well. It has been a very dry summer an the well seems to be dry.CR IP3-2005-04400 |
| Hudson River Discharge | Week 43 | The composite water sample hose for the site discharge canal was found to be located inside the canal structure instead of the Hudson River-canal mixing zone as stated in the REMP program description. Sample hose was relocated back to its previous location IAW REMP technical bases. CR-IP2-2005-4319 |

**TABLE B-2***
**ODCM ANNUAL SUMMARY - 2005**

| MEDIUM (UNITS) SEE TABLE | TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED | LLD (c,d) | INDICATOR LOCATIONS: MEAN (a) RANGE | LOCATION (b) OF HIGHEST ANNUAL MEAN: LOCATIONS AND DESIGNATION MEAN (a) RANGE | CONTROL LOCATION: MEAN (a) RANGE | NUMBER OF NONROUTINE REPORTS |
|---|---|---|---|---|---|---|
| DIRECT RADIATION (mR / standard quarter) B-3 | TLD Reads 164 | N/A | *14.0 (160/160) / 9.6 - 22.5* | #76 West Shore Drive North 1.21 Mi. (276°) DR13 18.9 *(4/4) / 17.2 - 20.2* | *15.9 (4/4) / 13.2 - 20.3* | 0 |
| AIR PARTICULATES AND RADIOIODINE (pCi/m$^3$) B-6, B-7, B-8 | GB (477) | | *0.015 (424/424) / 0.003 - 0.033* | #4 Algonquin Gas Line (Onsite) 0.28 Mi. (234o) 0.016 (53/53) / 0.004-0.029 | *0.016 (53/53) / 0.003-0.029* | 0 |
| | I-131 (467) | 0.07 | <Lc | <Lc | <Lc | 0 |
| | GSA (36) | | | | | |
| | Cs-134 | 0.05 | <Lc | <Lc | <Lc | 0 |
| | Cs-137 | 0.06 | <Lc | <Lc | <Lc | 0 |
| SURFACE HUDSON RIVER WATER (pCi/L) B-9, B-10 | H-3 (8) | 3000 | <Lc | <Lc | <Lc | 0 |
| | GSA (24) | | | | | |
| | Mn-54 | 15 | <Lc | <Lc | <Lc | 0 |
| | Co-58 | 15 | <Lc | <Lc | <Lc | 0 |
| | Fe-59 | 30 | <Lc | <Lc | <Lc | 0 |
| | Co-60 | 15 | <Lc | <Lc | <Lc | 0 |
| | Zn-65 | 30 | <Lc | <Lc | <Lc | 0 |
| | Zr/Nb-95 | 15 | <Lc | <Lc | <Lc | 0 |
| | I-131 | 15 | <Lc | <Lc | <Lc | 0 |
| | Cs-134 | 15 | <Lc | <Lc | <Lc | 0 |
| | Cs-137 | 18 | <Lc | <Lc | <Lc | 0 |
| | Ba/La-140 | 15 | <Lc | <Lc | <Lc | 0 |
| DRINKING WATER (pCi/L) B-11, B-12 | GB (12) | 4 | *2.39 (12/12) / 1.11 - 3.54* | Camp Field Resevoir 3.4 Mi (051°) 2.39 (12/12)/ 1.11 - 3.54 | N/A | 0 |
| | H-3 (4) | 2000 | <Lc | <Lc | N/A | 0 |
| | GSA (12) | | | | | |
| | Mn-54 | 15 | <Lc | <Lc | N/A | 0 |
| | Co-58 | 15 | <Lc | <Lc | N/A | 0 |
| | Fe-59 | 30 | <Lc | <Lc | N/A | 0 |
| | Co-60 | 15 | <Lc | <Lc | N/A | 0 |
| | Zn-65 | 30 | <Lc | <Lc | N/A | 0 |

**TABLE B-2***
**ODCM ANNUAL SUMMARY - 2005**

| MEDIUM (UNITS) SEE TABLE | TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED | LLD (c,d) | INDICATOR LOCATIONS: MEAN (a) RANGE | LOCATION (b) OF HIGHEST ANNUAL MEAN: LOCATIONS AND DESIGNATION MEAN (a) RANGE | CONTROL LOCATION: MEAN (a) RANGE | NUMBER OF NONROUTINE REPORTS |
|---|---|---|---|---|---|---|
| DRINKING WATER (CON'T) | Zr/Nb-95 | 15 | <Lc | <Lc | N/A | 0 |
| | I-131 | 15 | <Lc | <Lc | N/A | 0 |
| | Cs-134 | 15 | <Lc | <Lc | N/A | 0 |
| | Cs-137 | 18 | <Lc | <Lc | N/A | 0 |
| | Ba/La-140 | 15 | <Lc | <Lc | N/A | 0 |
| SHORELINE SOIL (pCi/kg - dry) B-13 | GSA (4) | | | | | |
| | Cs-134 | 150 | <Lc | <Lc | <Lc | 0 |
| | Cs-137 | 180 | <Lc | #50 Manitou Inlet 4.48 Mi. (347.5°) *174 (1/2) / 174 - 174* | *174 (1/2) / 174 - 174* | 0 |
| BROADLEAF VEGETATION (pCi/kg - wet) B-14 | GSA (54) | | | | | |
| | I-131 | 60 | <Lc | <Lc | <Lc | 0 |
| | Co-60 | N/A | <Lc | <Lc | <Lc | 0 |
| | Cs-134 | 60 | <Lc | <Lc | <Lc | 0 |
| | Cs-137 | 80 | <Lc | <Lc | <Lc | 0 |
| FISH AND INVERTEBRATES (pCi/kg - wet) B-15 | GSA (14) | | | | | |
| | Mn-54 | 130 | <Lc | <Lc | <Lc | 0 |
| | Co-58 | 130 | <Lc | <Lc | <Lc | 0 |
| | Fe-59 | 260 | <Lc | <Lc | <Lc | 0 |
| | Co-60 | 130 | <Lc | <Lc | <Lc | 0 |
| | Zn-65 | 260 | <Lc | <Lc | <Lc | 0 |
| | Cs-134 | 130 | <Lc | <Lc | <Lc | 0 |
| | Cs-137 | 150 | <Lc | <Lc | <Lc | 0 |

## TABLE B-3

## 2005 DIRECT RADIATION, QUARTERLY DATA
(mR per STANDARD QUARTER)

| Station ID | Sector | 1ST Quarter | 2ND Quarter | 3RD Quarter | 4TH Quarter | AVG | Yearly |
|---|---|---|---|---|---|---|---|
| DR-01 | N | 14.0 ± 0.7 | 14.2 ± 0.9 | 17.4 ± 0.9 | 15.7 ± 0.8 | 15.3 | 61 |
| DR-02 | NNE | 14.2 ± 0.9 | 12.6 ± 0.8 | 14.4 ± 0.8 | 16.0 ± 1.1 | 14.3 | 57 |
| DR-03 | NE | 12.4 ± 0.6 | 10.4 ± 0.8 | 12.6 ± 0.8 | 13.3 ± 1.0 | 12.2 | 49 |
| DR-04 | ENE | 13.2 ± 0.8 | 11.6 ± 1.0 | 14.5 ± 1.1 | 14.4 ± 0.6 | 13.4 | 54 |
| DR-05 | ENE | 13.0 ± 0.9 | 11.5 ± 0.8 | 14.5 ± 0.7 | 15.6 ± 0.9 | 13.6 | 55 |
| DR-06 | ESE | 12.8 ± 1.0 | 11.8 ± 0.9 | 14.1 ± 0.7 | 15.0 ± 0.7 | 13.5 | 54 |
| DR-07 | SE | 14.5 ± 0.7 | 13.9 ± 1.0 | 16.9 ± 0.9 | 17.1 ± 0.9 | 15.6 | 62 |
| DR-08 | SSE | 11.7 ± 0.7 | 11.1 ± 0.8 | 13.9 ± 0.8 | 13.8 ± 0.6 | 12.6 | 51 |
| DR-09 | S | 12.3 ± 1.0 | 12.0 ± 1.3 | 14.3 ± 0.9 | 15.1 ± 1.1 | 13.4 | 54 |
| DR-10 | SSW | 13.7 ± 1.2 | 12.9 ± 0.8 | 15.9 ± 1.0 | 16.1 ± 0.8 | 14.6 | 59 |
| DR-11 | SW | 10.3 ± 0.6 | 9.6 ± 0.8 | 11.5 ± 0.7 | 13.2 ± 0.7 | 11.2 | 45 |
| DR-12 | WSW | 16.0 ± 0.8 | 15.2 ± 1.3 | 18.3 ± 0.8 | 17.3 ± 0.9 | 16.7 | 67 |
| DR-13 | WSW | 18.5 ± 1.6 | 17.2 ± 1.0 | 20.2 ± 1.1 | 20.0 ± 0.8 | 18.9 | 76 |
| DR-14 | WNW | 12.2 ± 0.8 | 11.6 ± 0.8 | 14.3 ± 0.9 | 13.6 ± 0.8 | 12.9 | 52 |
| DR-15 | NW | 11.9 ± 0.8 | 11.6 ± 0.8 | 14.3 ± 0.7 | 13.9 ± 0.5 | 12.9 | 52 |
| DR-16 | NNW | 13.1 ± 0.7 | 12.9 ± 0.9 | 16.6 ± 1.1 | 15.3 ± 0.8 | 14.5 | 58 |
| DR-17 | N | 13.8 ± 1.0 | 13.6 ± 0.9 | 16.4 ± 0.8 | 15.5 ± 0.6 | 14.8 | 59 |
| DR-18 | NNE | 13.7 ± 0.9 | 12.2 ± 0.9 | 15.6 ± 0.7 | 16.0 ± 0.6 | 14.4 | 57 |
| DR-19 | NE | 14.8 ± 0.8 | 12.9 ± 1.2 | 16.2 ± 0.9 | 16.2 ± 0.8 | 15.0 | 60 |
| DR-20 | ENE | 13.2 ± 0.8 | 11.4 ± 0.8 | 14.4 ± 0.9 | 14.6 ± 0.8 | 13.4 | 54 |
| DR-21 | E | 12.2 ± 0.8 | 12.0 ± 0.9 | 14.5 ± 0.7 | 15.6 ± 0.7 | 13.6 | 54 |
| DR-22 | ESE | 10.4 ± 0.6 | 9.6 ± 0.9 | 12.1 ± 0.7 | 12.8 ± 0.7 | 11.2 | 45 |
| DR-23 | SE | 12.2 ± 0.7 | 11.7 ± 1.3 | 14.6 ± 0.7 | 16.0 ± 1.5 | 13.6 | 55 |
| DR-24 | SSE | 12.8 ± 0.8 | 12.6 ± 1.0 | 16.0 ± 0.9 | 16.2 ± 0.7 | 14.4 | 58 |
| DR-25 | S | 11.4 ± 0.8 | 10.6 ± 0.9 | 13.8 ± 0.6 | 13.0 ± 0.5 | 12.2 | 49 |
| DR-26 | SSW | 12.4 ± 0.7 | 12.2 ± 1.0 | 14.4 ± 0.8 | 13.9 ± 0.6 | 13.2 | 53 |
| DR-27 | SW | 12.2 ± 0.7 | 12.2 ± 0.9 | 14.8 ± 0.8 | 13.9 ± 0.8 | 13.3 | 53 |
| DR-28 | NW | 15.2 ± 1.0 | 15.5 ± 1.0 | 22.5 ± 1.7 | 19.3 ± 0.9 | 18.1 | 73 |
| DR-29 | W | 12.5 ± 0.8 | 12.5 ± 0.9 | 16.3 ± 0.9 | 14.5 ± 0.6 | 14.0 | 56 |
| DR-30 | SNS | 13.0 ± 0.8 | 13.9 ± 1.1 | 16.4 ± 0.7 | 14.5 ± 0.6 | 14.5 | 58 |
| DR-31 | WSW | 15.6 ± 0.8 | 16.0 ± 1.1 | 20.6 ± 1.1 | 17.8 ± 1.1 | 17.5 | 70 |
| DR-32 | NNW | 12.2 ± 0.8 | 11.2 ± 0.8 | 14.5 ± 0.8 | 13.1 ± 0.6 | 12.7 | 51 |
| DR-33 | NE | 13.8 ± 0.7 | 11.8 ± 0.8 | 14.7 ± 1.0 | 14.9 ± 0.7 | 13.8 | 55 |
| DR-34 | SE | 11.8 ± 0.7 | 11.3 ± 0.9 | 13.6 ± 0.7 | 13.8 ± 0.8 | 12.6 | 50 |
| DR-35 | NNE | 13.2 ± 0.7 | 12.1 ± 0.9 | 15.1 ± 0.7 | 15.9 ± 0.9 | 14.1 | 56 |
| DR-36 | NE | 15.0 ± 0.7 | 12.6 ± 0.9 | 15.2 ± 0.7 | 15.6 ± 0.8 | 14.6 | 58 |
| DR-37 | SSW | 12.3 ± 0.9 | 11.9 ± 0.8 | 14.2 ± 0.7 | 14.1 ± 0.6 | 13.1 | 53 |
| DR-38 | S | 12.3 ± 0.9 | 11.9 ± 0.9 | 13.9 ± 0.7 | 14.4 ± 0.8 | 13.1 | 52 |
| DR-39 | SSW | 13.4 ± 1.0 | 13.9 ± 1.0 | 15.6 ± 0.7 | 14.5 ± 0.7 | 14.4 | 58 |
| DR-40** | N | 13.2 ± 0.8 | 15.0 ± 1.0 | 20.3 ± 1.0 | 15.2 ± 0.9 | 15.9 | 64 |
| DR-41 | SSE | 12.4 ± 0.9 | 11.3 ± 0.8 | 14.2 ± 0.6 | 14.4 ± 0.6 | 13.1 | 52 |
| AVERAGE | | 13.1 ± 0.8 | 12.5 ± 0.9 | 15.5 ± 0.8 | 15.2 ± 0.8 | 14.1 | 56.2 |

* Data not available

** Control Location

## TABLE B-4

## DIRECT RADIATION, 1999 THROUGH 2005 DATA

(mR per Standard Quarter)

| Station ID | Mean (1999-2004) | Standard Deviation (1999-2004) | Minimum Value (1999-2004) | Maximum Value (1999-2004) | 2005 Average |
|---|---|---|---|---|---|
| DR-01 | 15.7 | 1.5 | 13.2 | 20.7 | 15.3 |
| DR-02 | 15.5 | 2.8 | 12.3 | 23.3 | 14.3 |
| DR-03 | 12.0 | 1.2 | 9.3 | 14.4 | 12.2 |
| DR-04 | 13.5 | 1.5 | 11.1 | 16.3 | 13.4 |
| DR-05 | 13.5 | 1.2 | 11.4 | 15.6 | 13.6 |
| DR-06 | 13.3 | 1.3 | 10.8 | 16.3 | 13.5 |
| DR-07 | 16.0 | 1.9 | 13.2 | 21.7 | 15.6 |
| DR-08 | 13.0 | 1.3 | 11.1 | 16.3 | 12.6 |
| DR-09 | 12.9 | 2.8 | 0.1 | 16.7 | 13.4 |
| DR-10 | 13.7 | 2.4 | 5.3 | 16.8 | 14.6 |
| DR-11 | 11.3 | 1.1 | 9.5 | 14.2 | 11.2 |
| DR-12 | 16.8 | 1.5 | 14.5 | 19.8 | 16.7 |
| DR-13 | 18.7 | 1.4 | 16.2 | 20.9 | 18.9 |
| DR-14 | 13.2 | 1.2 | 11.1 | 15.9 | 12.9 |
| DR-15 | 13.5 | 1.6 | 11.4 | 19.0 | 12.9 |
| DR-16 | 14.7 | 1.6 | 11.4 | 18.4 | 14.5 |
| DR-17 | 15.0 | 1.3 | 12.3 | 17.7 | 14.8 |
| DR-18 | 14.0 | 1.4 | 10.8 | 16.0 | 14.4 |
| DR-19 | 14.8 | 1.5 | 12.3 | 18.2 | 15.0 |
| DR-20 | 13.6 | 1.4 | 11.4 | 16.1 | 13.4 |
| DR-21 | 13.6 | 1.2 | 11.7 | 16.0 | 13.6 |
| DR-22 | 11.4 | 1.2 | 9.6 | 14.1 | 11.2 |
| DR-23 | 13.9 | 1.5 | 11.4 | 17.1 | 13.6 |
| DR-24 | 14.0 | 1.5 | 10.8 | 16.2 | 14.4 |
| DR-25 | 12.3 | 1.1 | 9.9 | 14.9 | 12.2 |
| DR-26 | 13.6 | 1.2 | 11.7 | 17.0 | 13.2 |
| DR-27 | 13.6 | 1.2 | 10.2 | 15.6 | 13.3 |
| DR-28 | 15.6 | 2.1 | 12.2 | 22.5 | 18.1 |
| DR-29 | 16.5 | 2.6 | 9.0 | 21.9 | 14.0 |
| DR-30 | 15.8 | 2.5 | 9.9 | 23.8 | 14.5 |
| DR-31 | 17.9 | 2.6 | 12.3 | 24.6 | 17.5 |
| DR-32 | 13.1 | 1.7 | 9.9 | 17.7 | 12.7 |
| DR-33 | 10.7 | 2.5 | 7.2 | 15.6 | 13.8 |
| DR-34 | 13.3 | 1.7 | 9.9 | 17.6 | 12.6 |
| DR-35 | 14.2 | 1.7 | 11.1 | 18.0 | 14.1 |
| DR-36 | 15.4 | 2.5 | 12.3 | 25.5 | 14.6 |
| DR-37 | 13.7 | 1.3 | 11.7 | 16.2 | 13.1 |
| DR-38 | 13.0 | 1.4 | 11.1 | 17.9 | 13.1 |
| DR-39 | 15.6 | 1.5 | 12.9 | 19.4 | 14.4 |
| DR-40** | 15.2 | 1.9 | 12.6 | 20.3 | 15.9 |
| DR-41 | 13.2 | 1.8 | 10.8 | 19.4 | 13.1 |
| Average | 14.2 | | | | 14.1 |

* Data not available

** Control Location

## TABLE B-5

## 2005 DIRECT RADIATION
## INNER AND OUTER RINGS
(mR per Standard Quarter)

| Inner Ring ID | Outer Ring ID | Sector | Inner Ring Annual Average | Outer Ring Annual Average |
|---|---|---|---|---|
| DR-01 | DR-17 | N | 15.3 | 14.8 |
| DR-02 | DR-18 | NNE | 14.3 | 14.4 |
| DR-03 | DR-19 | NE | 12.2 | 15.0 |
| DR-04 | DR-20 | ENE | 13.4 | 13.4 |
| DR-05 | DR-21 | E | 13.6 | 13.6 |
| DR-06 | DR-22 | ESE | 13.5 | 11.2 |
| DR-07 | DR-23 | SE | 15.6 | 13.6 |
| DR-08 | DR-24 | SSE | 12.6 | 14.4 |
| DR-09 | DR-25 | S | 13.4 | 12.2 |
| DR-10 | DR-26 | SSW | 14.6 | 13.2 |
| DR-11 | DR-27 | SW | 11.2 | 13.3 |
| DR-12 | DR-28 | WSW | 16.7 | 18.1 |
| DR-13 | DR-29 | W | 18.9 | 14.0 |
| DR-14 | DR-30 | WNW | 12.9 | 14.5 |
| DR-15 | DR-31 | NW | 12.9 | 17.5 |
| DR-16 | DR-32 | NNW | 14.5 | 12.7 |
| Average | | | 14.1 | 14.1 |

## TABLE B-6

## GROSS BETA ACTIVITY IN AIRBORNE PARTICULATE SAMPLES-2005

($pCi/m^3 \pm 1$ sigma)

**STATION #**

| Week # | End Date | 4 | 5 | 94 | 95 | 23** |
|---|---|---|---|---|---|---|
| 1 | 1/4/2005 | 0.027 ± 0.002 | 0.025 ± 0.002 | 0.02 ± 0.002 | 0.02 ± 0.002 | 0.021 ± 0.002 |
| 2 | 1/11/2005 | 0.013 ± 0.001 | 0.01 ± 0.001 | 0.01 ± 0.001 | 0.011 ± 0.001 | 0.015 ± 0.002 |
| 3 | 1/18/2005 | 0.016 ± 0.002 | 0.014 ± 0.002 | 0.018 ± 0.002 | 0.014 ± 0.001 | 0.013 ± 0.001 |
| 4 | 1/25/2005 | 0.014 ± 0.002 | 0.018 ± 0.002 | 0.016 ± 0.002 | 0.018 ± 0.002 | 0.02 ± 0.002 |
| 5 | 2/1/2005 | 0.014 ± 0.002 | 0.012 ± 0.002 | 0.014 ± 0.001 | 0.015 ± 0.002 | 0.015 ± 0.001 |
| 6 | 2/8/2005 | 0.027 ± 0.002 | 0.021 ± 0.002 | 0.023 ± 0.002 | 0.024 ± 0.002 | 0.023 ± 0.002 |
| 7 | 2/15/2005 | 0.019 ± 0.002 | 0.019 ± 0.002 | 0.016 ± 0.002 | 0.018 ± 0.002 | 0.019 ± 0.002 |
| 8 | 2/22/2005 | 0.015 ± 0.002 | 0.013 ± 0.002 | 0.014 ± 0.001 | 0.013 ± 0.002 | 0.011 ± 0.001 |
| 9 | 2/28/2005 | 0.015 ± 0.002 | 0.017 ± 0.002 | 0.012 ± 0.002 | 0.014 ± 0.002 | 0.012 ± 0.002 |
| 10 | 3/8/2005 | 0.016 ± 0.001 | 0.014 ± 0.001 | 0.017 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.001 |
| 11 | 3/14/2005 | 0.014 ± 0.002 | 0.013 ± 0.002 | 0.011 ± 0.001 | 0.012 ± 0.002 | 0.015 ± 0.001 |
| 12 | 3/22/2005 | 0.018 ± 0.002 | 0.015 ± 0.002 | 0.014 ± 0.001 | 0.013 ± 0.001 | 0.014 ± 0.002 |
| 13 | 3/29/2005 | 0.01 ± 0.001 | 0.01 ± 0.001 | 0.009 ± 0.001 | 0.011 ± 0.001 | 0.01 ± 0.001 |
| 14 | 4/5/2005 | 0.005 ± 0.001 | 0.005 ± 0.001 | 0.005 ± 0.001 | 0.005 ± 0.001 | 0.004 ± 0.001 |
| 15 | 4/12/2005 | 0.012 ± 0.002 | 0.014 ± 0.001 | 0.013 ± 0.001 | 0.011 ± 0.001 | 0.016 ± 0.001 |
| 16 | 4/19/2005 | 0.024 ± 0.002 | 0.022 ± 0.002 | 0.028 ± 0.002 | 0.023 ± 0.002 | 0.013 ± 0.001 |
| 17 | 4/26/2005 | 0.018 ± 0.002 | 0.015 ± 0.001 | 0.014 ± 0.001 | 0.011 ± 0.001 | 0.013 ± 0.001 |
| 18 | 5/3/2005 | 0.012 ± 0.001 | 0.013 ± 0.001 | 0.012 ± 0.001 | 0.014 ± 0.001 | 0.008 ± 0.001 |
| 19 | 5/10/2005 | 0.017 ± 0.001 | 0.011 ± 0.001 | 0.009 ± 0.001 | 0.008 ± 0.001 | 0.012 ± 0.001 |
| 20 | 5/17/2005 | 0.014 ± 0.002 | 0.015 ± 0.001 | 0.015 ± 0.001 | 0.017 ± 0.001 | 0.015 ± 0.001 |
| 21 | 5/24/2005 | 0.013 ± 0.001 | 0.011 ± 0.001 | 0.012 ± 0.001 | 0.01 ± 0.001 | 0.015 ± 0.001 |
| 22 | 5/31/2005 | 0.009 ± 0.001 | 0.01 ± 0.001 | 0.009 ± 0.001 | 0.009 ± 0.001 | 0.009 ± 0.001 |
| 23 | 6/7/2005 | 0.024 ± 0.002 | 0.024 ± 0.002 | 0.026 ± 0.002 | 0.022 ± 0.002 | 0.02 ± 0.002 |
| 24 | 6/14/2005 | 0.024 ± 0.002 | 0.024 ± 0.002 | 0.025 ± 0.002 | 0.022 ± 0.002 | 0.02 ± 0.002 |
| 25 | 6/21/2005 | 0.012 ± 0.001 | 0.012 ± 0.001 | 0.01 ± 0.001 | 0.008 ± 0.001 | 0.011 ± 0.001 |
| 26 | 6/27/2005 | 0.017 ± 0.002 | 0.021 ± 0.002 | 0.021 ± 0.002 | 0.02 ± 0.002 | 0.023 ± 0.002 |

* Sample deviation.
** Control location.

## TABLE B-6

## GROSS BETA ACTIVITY IN AIRBORNE PARTICULATE SAMPLES-2005

($pCi/m^3$ ± 1 sigma)

**STATION #**

| Week # | End Date | 4 | 5 | 94 | 95 | 23** |
|---|---|---|---|---|---|---|
| 27 | 7/5/2005 | 0.019 ± 0.001 | 0.018 ± 0.001 | 0.017 ± 0.001 | 0.014 ± 0.001 | 0.018 ± 0.001 |
| 28 | 7/12/2005 | 0.016 ± 0.002 | 0.025 ± 0.002 | 0.019 ± 0.001 | 0.019 ± 0.002 | 0.016 ± 0.002 |
| 29 | 7/19/2005 | 0.016 ± 0.001 | 0.009 ± 0.001 | 0.011 ± 0.001 | 0.012 ± 0.001 | 0.017 ± 0.002 |
| 30 | 7/26/2005 | 0.017 ± 0.001 | 0.017 ± 0.001 | 0.017 ± 0.001 | 0.017 ± 0.001 | 0.021 ± 0.002 |
| 31 | 8/2/2005 | 0.021 ± 0.002 | 0.02 ± 0.002 | 0.018 ± 0.001 | 0.019 ± 0.002 | 0.019 ± 0.002 |
| 32 | 8/9/2005 | 0.027 ± 0.002 | 0.028 ± 0.002 | 0.025 ± 0.002 | 0.026 ± 0.002 | 0.029 ± 0.002 |
| 33 | 8/16/2005 | 0.023 ± 0.002 | 0.023 ± 0.002 | 0.021 ± 0.002 | 0.02 ± 0.002 | 0.024 ± 0.002 |
| 34 | 8/23/2005 | 0.014 ± 0.001 | 0.017 ± 0.002 | 0.018 ± 0.001 | 0.015 ± 0.001 | 0.016 ± 0.002 |
| 35 | 8/30/2005 | 0.014 ± 0.001 | 0.007 ± 0.001 | 0.011 ± 0.001 | 0.012 ± 0.001 | 0.014 ± 0.001 |
| 36 | 9/6/2005 | 0.014 ± 0.001 | 0.012 ± 0.001 | 0.015 ± 0.001 | 0.014 ± 0.001 | 0.016 ± 0.001 |
| 37 | 9/13/2005 | 0.021 ± 0.002 | 0.023 ± 0.002 | 0.023 ± 0.002 | 0.022 ± 0.002 | 0.027 ± 0.002 |
| 38 | 9/20/2005 | 0.021 ± 0.002 | 0.022 ± 0.002 | 0.021 ± 0.002 | 0.017 ± 0.001 | 0.027 ± 0.002 |
| 39 | 9/27/2005 | 0.024 ± 0.002 | 0.023 ± 0.002 | 0.02 ± 0.002 | 0.024 ± 0.002 | 0.028 ± 0.002 |
| 40 | 10/4/2005 | 0.018 ± 0.002 | 0.015 ± 0.001 | 0.018 ± 0.001 | 0.016 ± 0.001 | 0.02 ± 0.002 |
| 41 | 10/11/2005 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.009 ± 0.001 | 0.011 ± 0.001 | 0.013 ± 0.001 |
| 42 | 10/18/2005 | 0.004 ± 0.001 | 0.005 ± 0.001 | 0.005 ± 0.001 | 0.004 ± 0.001 | 0.003 ± 0.001 |
| 43 | 10/25/2005 | 0.008 ± 0.001 | 0.01 ± 0.001 | 0.009 ± 0.001 | 0.009 ± 0.001 | 0.012 ± 0.001 |
| 44 | 11/1/2005 | 0.012 ± 0.001 | 0.012 ± 0.001 | 0.01 ± 0.001 | 0.012 ± 0.001 | 0.008 ± 0.001 |
| 45 | 11/8/2005 | 0.02 ± 0.002 | 0.02 ± 0.002 | 0.019 ± 0.002 | 0.021 ± 0.002 | 0.024 ± 0.002 |
| 46 | 11/15/2005 | 0.015 ± 0.001 | 0.012 ± 0.001 | 0.016 ± 0.001 | 0.013 ± 0.001 | 0.019 ± 0.002 |
| 47 | 11/21/2005 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 |
| 48 | 11/29/2005 | 0.012 ± 0.001 | 0.012 ± 0.001 | 0.013 ± 0.001 | 0.01 ± 0.001 | 0.013 ± 0.001 |
| 49 | 12/5/2005 | 0.012 ± 0.001 | 0.009 ± 0.001 | 0.009 ± 0.001 | 0.009 ± 0.001 | 0.012 ± 0.001 |
| 50 | 12/13/2005 | 0.022 ± 0.001 | 0.018 ± 0.003 | 0.02 ± 0.001 | 0.022 ± 0.001 | 0.024 ± 0.002 |
| 51 | 12/20/2005 | 0.015 ± 0.001 | 0.015 ± 0.003 | 0.013 ± 0.001 | 0.014 ± 0.001 | 0.016 ± 0.001 |
| 52 | 12/27/2005 | 0.029 ± 0.002 | 0.033 ± 0.002 | 0.028 ± 0.002 | 0.027 ± 0.002 | 0.029 ± 0.002 |
| 53 | 1/4/2006 | 0.012 +- 0.001 | 0.012 +- 0.001 | 0.013 +- 0.001 | 0.008 +- 0.001 | 0.011 +- 0.001 |

* Sample deviation.
** Control location.

## TABLE B-6

## GROSS BETA ACTIVITY IN AIRBORNE PARTICULATE SAMPLES-2005

($pCi/m^3 \pm 1$ sigma)

**STATION #**

| Week # | End Date | 22 | 27 | 29 | 44 |
|---|---|---|---|---|---|
| 1 | 1/3/2005 | 0.019 ± 0.001 | 0.024 ± 0.002 | 0.021 ± 0.001 | 0.025 ± 0.002 |
| 2 | 1/10/2005 | 0.013 ± 0.001 | 0.012 ± 0.001 | 0.012 ± 0.001 | 0.012 ± 0.001 |
| 3 | 1/18/2005 | 0.013 ± 0.001 | 0.016 ± 0.002 | 0.015 ± 0.001 | 0.015 ± 0.001 |
| 4 | 1/24/2005 | 0.02 ± 0.002 | 0.016 ± 0.002 | 0.019 ± 0.001 | 0.018 ± 0.002 |
| 5 | 2/1/2005 | 0.013 ± 0.001 | 0.014 ± 0.002 | 0.014 ± 0.001 | 0.015 ± 0.001 |
| 6 | 2/7/2005 | 0.02 ± 0.002 | 0.021 ± 0.002 | 0.019 ± 0.002 | 0.022 ± 0.002 |
| 7 | 2/14/2005 | 0.016 ± 0.001 | 0.015 ± 0.002 | 0.017 ± 0.001 | 0.017 ± 0.002 |
| 8 | 2/22/2005 | 0.015 ± 0.001 | 0.012 ± 0.001 | 0.01 ± 0.001 | 0.014 ± 0.001 |
| 9 | 2/28/2005 | 0.015 ± 0.002 | 0.015 ± 0.002 | 0.013 ± 0.001 | 0.014 ± 0.002 |
| 10 | 3/7/2005 | 0.016 ± 0.001 | 0.015 ± 0.001 | 0.014 ± 0.001 | 0.013 ± 0.001 |
| 11 | 3/14/2005 | 0.014 ± 0.001 | 0.013 ± 0.002 | 0.015 ± 0.002 | 0.016 ± 0.002 |
| 12 | 3/21/2005 | 0.017 ± 0.001 | 0.012 ± 0.001 | 0.014 ± 0.001 | 0.012 ± 0.001 |
| 13 | 3/28/2005 | 0.011 ± 0.001 | 0.009 ± 0.001 | 0.009 ± 0.001 | 0.012 ± 0.001 |
| 14 | 4/4/2005 | 0.006 ± 0.001 | 0.006 ± 0.001 | 0.004 ± 0.001 | 0.004 ± 0.001 |
| 15 | 4/11/2005 | 0.011 ± 0.001 | 0.012 ± 0.001 | 0.011 ± 0.001 | 0.01 ± 0.001 |
| 16 | 4/18/2005 | 0.014 ± 0.001 | 0.021 ± 0.002 | 0.013 ± 0.001 | 0.013 ± 0.001 |
| 17 | 4/25/2005 | 0.013 ± 0.001 | 0.012 ± 0.001 | 0.01 ± 0.001 | 0.01 ± 0.001 |
| 18 | 5/2/2005 | 0.008 ± 0.001 | 0.011 ± 0.001 | 0.007 ± 0.001 | 0.006 ± 0.001 |
| 19 | 5/9/2005 | 0.009 ± 0.001 | 0.011 ± 0.001 | 0.005 ± 0.001 | 0.007 ± 0.001 |
| 20 | 5/16/2005 | 0.014 ± 0.001 | 0.016 ± 0.001 | 0.013 ± 0.001 | 0.012 ± 0.001 |
| 21 | 5/23/2005 | 0.014 ± 0.001 | 0.011 ± 0.001 | 0.011 ± 0.001 | 0.01 ± 0.001 |
| 22 | 5/31/2005 | 0.009 ± 0.001 | 0.006 ± 0.001 | 0.008 ± 0.001 | 0.008 ± 0.001 |
| 23 | 6/6/2005 | 0.02 ± 0.001 | 0.0247 ± 0.002 | 0.019 ± 0.001 | 0.018 ± 0.001 |
| 24 | 6/13/2005 | 0.02 ± 0.001 | 0.025 ± 0.002 | 0.019 ± 0.001 | 0.018 ± 0.001 |
| 25 | 6/20/2005 | 0.007 ± 0.001 | 0.009 ± 0.001 | 0.007 ± 0.001 | 0.006 ± 0.001 |
| 26 | 6/27/2005 | 0.018 ± 0.001 | 0.022 ± 0.002 | 0.02 ± 0.001 | 0.016 ± 0.001 |

* Sample deviation.
** Control location.

## TABLE B-6

## GROSS BETA ACTIVITY IN AIRBORNE PARTICULATE SAMPLES-2005

($pCi/m^3 \pm 1$ sigma)

**STATION #**

| Week # | End Date | 22 | 27 | 29 | 44 |
|---|---|---|---|---|---|
| 27 | 7/5/2005 | 0.013 ± 0.001 | 0.014 ± 0.001 | 0.015 ± 0.001 | 0.012 ± 0.001 |
| 28 | 7/11/2005 | 0.011 ± 0.001 | 0.022 ± 0.002 | 0.011 ± 0.001 | 0.013 ± 0.001 |
| 29 | 7/18/2005 | 0.013 ± 0.001 | 0.013 ± 0.001 | 0.015 ± 0.001 | 0.015 ± 0.001 |
| 30 | 7/25/2005 | 0.017 ± 0.001 | 0.019 ± 0.002 | 0.017 ± 0.001 | 0.012 ± 0.001 |
| 31 | 8/1/2005 | 0.015 ± 0.001 | 0.018 ± 0.001 | 0.016 ± 0.001 | 0.018 ± 0.001 |
| 32 | 8/8/2005 | 0.026 ± 0.002 | 0.027 ± 0.002 | 0.023 ± 0.001 | 0.025 ± 0.002 |
| 33 | 8/15/2005 | 0.023 ± 0.002 | 0.021 ± 0.002 | 0.021 ± 0.001 | 0.025 ± 0.002 |
| 34 | 8/23/2005 | 0.017 ± 0.001 | 0.02 ± 0.002 | 0.019 ± 0.001 | 0.015 ± 0.001 |
| 35 | 8/29/2005 | 0.012 ± 0.001 | 0.011 ± 0.001 | 0.011 ± 0.001 | 0.011 ± 0.001 |
| 36 | 9/6/2005 | 0.012 ± 0.001 | 0.014 ± 0.001 | 0.012 ± 0.001 | 0.014 ± 0.001 |
| 37 | 9/12/2005 | 0.018 ± 0.001 | 0.023 ± 0.002 | 0.021 ± 0.001 | 0.019 ± 0.002 |
| 38 | 9/19/2005 | 0.025 ± 0.001 | 0.019 ± 0.001 | 0.019 ± 0.001 | 0.022 ± 0.002 |
| 39 | 9/26/2005 | 0.024 ± 0.001 | 0.023 ± 0.002 | 0.025 ± 0.001 | 0.024 ± 0.002 |
| 40 | 10/3/2005 | 0.016 ± 0.001 | 0.017 ± 0.001 | 0.013 ± 0.001 | 0.015 ± 0.001 |
| 41 | 10/11/2005 | 0.009 ± 0.001 | 0.012 ± 0.001 | 0.01 ± 0.001 | 0.012 ± 0.001 |
| 42 | 10/17/2005 | 0.004 ± 0.001 | 0.004 ± 0.001 | 0.005 ± 0.001 | 0.003 ± 0.001 |
| 43 | 10/24/2005 | 0.01 ± 0.001 | 0.012 ± 0.001 | 0.01 ± 0.001 | 0.009 ± 0.001 |
| 44 | 10/31/2005 | 0.008 ± 0.001 | 0.01 ± 0.001 | 0.008 ± 0.001 | 0.006 ± 0.001 |
| 45 | 11/7/2005 | 0.017 ± 0.002 | 0.021 ± 0.002 | 0.021 ± 0.001 | 0.023 ± 0.002 |
| 46 | 11/15/2005 | 0.014 ± 0.001 | 0.015 ± 0.001 | 0.013 ± 0.001 | 0.017 ± 0.001 |
| 47 | 11/21/2005 | 0.014 ± 0.001 | 0.016 ± 0.002 | 0.014 ± 0.001 | 0.005 ± 0.001 |
| 48 | 11/28/2005 | 0.011 ± 0.001 | 0.012 ± 0.001 | 0.01 ± 0.001 | 0.012 ± 0.001 |
| 49 | 12/6/2005 | 0.011 ± 0.001 | 0.011 ± 0.001 | 0.012 ± 0.001 | 0.011 ± 0.001 |
| 50 | 12/12/2005 | 0.021 ± 0.001 | 0.023 ± 0.001 | 0.021 ± 0.001 | 0.023 ± 0.002 |
| 51 | 12/19/2005 | 0.015 ± 0.001 | 0.012 ± 0.001 | 0.012 ± 0.001 | 0.013 ± 0.001 |
| 52 | 12/26/2005 | 0.024 ± 0.001 | 0.0275 ± 0.002 | 0.024 ± 0.001 | 0.027 ± 0.002 |
| 53 | 1/3/2006 | 0.01 +- 0.001 | 0.0122 +- 0.001 | 0.011 +- 0.001 | 0.012 +- 0.001 |

* Sample deviation.
** Control location.

# TABLE B-7
# CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES OF AIR PARTICULATE SAMPLES** - 2004
(RESULTS IN UNITS OF 1 0-3 pCi/m3 ± 1 SIGMA)

**1ST QUARTER 2005**

| ISOTOPE | MIN. REQ. CL* | ALGONQUIN STA-4 | NYU TOWER STA-5 | CROTON PT STA-27 | TRAINING BLDG STA-94 | MET TOWER STA-95 |
|---|---|---|---|---|---|---|
| Be-7 | | 128.6±17.35 | 114±13.67 | 119.8±13.15 | 100.2±12.9 | 126.8±13.51 |
| K-40 | | <7.82 | <5.01 | <5.88 | 41.36±9.76 | <9.2 |
| Mn-54 | | **<0.57** | <0.66 | <0.45 | <0.57 | <0.42 |
| Co-58 | | <1.25 | **<6.01** | **<0.51** | <0.85 | <0.62 |
| Fe-59 | | **<4.26** | <2.73 | **<2.45** | <4.1 | <2.51 |
| Co-60 | | **<0.84** | <0.76 | <0.39 | <1.04 | <0.49 |
| Zn-65 | | <1.77 | <1.34 | <0.79 | <0.96 | <0.87 |
| Zr-95 | | <2.55 | <1.42 | **<0.90** | <1.8 | <0.92 |
| Nb-95 | | <1.57 | <1.23 | <1.95 | <0.99 | <1.13 |
| Ru-103 | | <1.64 | <1.21 | <0.93 | <1.28 | <0.99 |
| Ru-106 | | <6.98 | <5.08 | <2.5 | <7.54 | <6.59 |
| I-131 | | <12.73 | <10.77 | <11.8 | <10.78 | <11.15 |
| Cs-134 | (25.0)* | <0.78 | <0.95 | <0.54 | <0.57 | <0.84 |
| Cs-137 | (30.0)* | <0.75 | <0.54 | <0.4 | <0.57 | <0.38 |
| BaLa-140 | | <12.5 | <9.14 | **<6.19** | **<6.94** | **<6.90** |
| Ce-141 | | <1.72 | <1.35 | <1.04 | <1.64 | <1.16 |
| TlCe-144 | | <2.48 | <2.09 | <1.34 | <3.09 | <2.19 |
| Ra-226 | | <8.81 | <8.12 | <7.41 | <9.51 | <6.25 |
| AcTh-228 | | **<2.09** | <2.36 | <2.4 | <1.71 | <2.03 |
| | | | | | | |

**BOLD PRINT INDICATES REPORTED LLD VALUES**

* Indicates naturally occurring.
** "Less than" values expressed as Critical Level (Lc), unless otherwise noted.
*** Reported as sample LLD.

# TABLE B-7
# CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES OF AIR PARTICULATE SAMPLES** - 2004
(RESULTS IN UNITS OF 1 0-3 pCi/m3 ± 1 SIGMA)

1ST QUARTER 2005

| ISOTOPE | MIN. REQ. CL* | LOVETT STA-22 | ROSETON STA-23 | GRASSY PT STA-29 | PEEKSKILL STA-44 |
|---|---|---|---|---|---|
| Be-7 | | 103.3±13.94 | 107.8±12.92 | 117.3±11.42 | 110±14.09 |
| K-40 | | <6.2 | <4.68 | <4.39 | <8.9 |
| Mn-54 | | **<0.45** | <0.62 | <0.24 | <0.49 |
| Co-58 | | <1 | **<0.57** | <0.36 | <0.52 |
| Fe-59 | | **<3.43** | <2.59 | <1.72 | <3.54 |
| Co-60 | | **<0.67** | <0.71 | <0.41 | <0.69 |
| Zn-65 | | <1.41 | <1.26 | <0.6 | <2 |
| Zr-95 | | <2.04 | <1.34 | <0.64 | <1.2 |
| Nb-95 | | <1.27 | <1.17 | <0.56 | <1.05 |
| Ru-103 | | <1.33 | <1.15 | <0.71 | <1.47 |
| Ru-106 | | <5.55 | <4.75 | <2.65 | <6.43 |
| I-131 | | <11 | <10.95 | <8.36 | <11.48 |
| Cs-134 | (25.0)* | <0.62 | <0.88 | <0.4 | <0.85 |
| Cs-137 | (30.0)* | <0.59 | <0.51 | <0.24 | <0.42 |
| BaLa-140 | | <10.46 | <9 | **<4.90** | **<7.65** |
| Ce-141 | | <1.39 | <1.29 | <1.04 | <1.81 |
| TlCe-144 | | <1.97 | <1.95 | <1.26 | <3.23 |
| Ra-226 | | <6.98 | <7.58 | <3.92 | <6.8 |
| AcTh-228 | | **<1.66** | <2.21 | <0.8 | <2.82 |
| | | | | | |

**BOLD PRINT INDICATES REPORTED LLD VALUES**

* Indicates naturally occurring.
** "Less than" values expressed as Critical Level (Lc), unless otherwise noted.
*** Reported as sample LLD.

# TABLE B-7
## CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES OF AIR PARTICULATE SAMPLES** - 2004
(RESULTS IN UNITS OF 1 0-3 pCi/m3 ± 1 SIGMA)

**2ND QUARTER 2005**

| ISOTOPE | MIN. REQ. CL* | ALGONQUIN STA-4 | NYU TOWER STA-5 | CROTON PT STA-27 | U3TRNBLDG STA-94 | MET TOWER STA-95 |
|---|---|---|---|---|---|---|
| Be-7 | | 77.88±14.17 | 102.6±12.99 | 111.7±13.43 | 107.8±15.57 | 76.22±11.2 |
| K-40 | | <9.82 | <4.64 | 51.25±10.46 | **<9.37** | **<5.27** |
| Mn-54 | | <0.83 | <0.71 | <0.7 | <0.48 | <0.35 |
| Co-58 | | <1.96 | <0.71 | <0.49 | **<0.86** | <1.1 |
| Fe-59 | | <4.19 | **<2.53** | <2.3 | <3.44 | **<2.44** |
| Co-60 | | **<1.13** | <0.43 | <0.99 | <0.79 | **<0.53** |
| Zn-65 | | <1.91 | <1.75 | <1.42 | **<1.70** | <1.48 |
| Zr-95 | | <2.43 | <0.89 | <2.13 | **<1.50** | <0.87 |
| Nb-95 | | **<1.51** | <0.73 | <1.15 | **<1.23** | <1.43 |
| Ru-103 | | **<9.88** | <0.81 | <0.87 | <1.56 | <0.79 |
| Ru-106 | | <5.21 | <3.91 | <4.6 | <7.39 | **<3.14** |
| I-131 | | <8.5 | <2.81 | <6.94 | <6.98 | <6.15 |
| Cs-134 | (25.0)* | <0.74 | <0.95 | <0.7 | <0.78 | <0.51 |
| Cs-137 | (30.0)* | <0.98 | <0.52 | <0.52 | <0.69 | **<0.29** |
| BaLa-140 | | <9.82 | **<5.02** | **<5.37** | **<8.83** | <4.49 |
| Ce-141 | | <1.26 | <0.97 | <1.43 | <1.35 | <0.85 |
| TlCe-144 | | <2.86 | <1.68 | <2.91 | <1.35 | **<1.81** |
| Ra-226 | | <9.97 | <7.02 | <12.58 | <10.02 | <5.31 |
| AcTh-228 | | <2.37 | <.00139 | <1.28 | **<2.26** | <1.17 |
| | | | | | | |

**BOLD PRINT INDICATES REPORTED LLD VALUES**

* Indicates naturally occurring.
** "Less than" values expressed as Critical Level (Lc), unless otherwise noted.
*** Reported as sample LLD.

# TABLE B-7
# CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES OF AIR PARTICULATE SAMPLES** - 2004
(RESULTS IN UNITS OF 1 0-3 pCi/m3 ± 1 SIGMA)

2ND QUARTER 2005

| ISOTOPE | MIN. REQ. CL* | LOVETT STA-22 | ROSETON STA-23 | GRASSY PT STA-29 | PEEKSKILL STA-44 |
|---|---|---|---|---|---|
| Be-7 | | 111.8±12.77 | 101.6±16.52 | 118±10.78 | 89.49±12.25 |
| K-40 | | <5.96 | <8.56 | **<3.72** | **<5.77** |
| Mn-54 | | <0.48 | <0.51 | <0.42 | <0.7 |
| Co-58 | | <0.56 | <1.22 | <0.6 | <1.21 |
| Fe-59 | | <1.85 | <3.67 | <1.6 | <4.63 |
| Co-60 | | <0.56 | <0.84 | <0.42 | **<0.58** |
| Zn-65 | | <1.14 | <2.36 | <1.04 | <1.01 |
| Zr-95 | | <0.91 | <1.5 | <1.06 | <1.81 |
| Nb-95 | | <1.2 | **<1.32** | <0.72 | <1.77 |
| Ru-103 | | <0.7 | <1.49 | <0.56 | <0.87 |
| Ru-106 | | <3.68 | <4.54 | <4.26 | <6.51 |
| I-131 | | <3.97 | <11.47 | <4.39 | <4.97 |
| Cs-134 | (25.0)* | <0.69 | <0.64 | <0.51 | <0.61 |
| Cs-137 | (30.0)* | <0.42 | <0.43 | <0.18 | <0.52 |
| BaLa-140 | | **<4.34** | <9.49 | <4.52 | <5.25 |
| Ce-141 | | <1.28 | <1.03 | <0.83 | <1.39 |
| TiCe-144 | | <2.18 | <1.30 | <1.09 | <2.73 |
| Ra-226 | | <7.63 | <6.14 | <3.42 | <8.89 |
| AcTh-228 | | <1.78 | <2.92 | <0.82 | <1.49 |
| | | | | | |

BOLD PRINT INDICATES REPORTED LLD VALUES

* Indicates naturally occurring.
** "Less than" values expressed as Critical Level (Lc), unless otherwise noted.
*** Reported as sample LLD.

# TABLE B-7
## CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES OF AIR PARTICULATE SAMPLES** - 2004
(RESULTS IN UNITS OF 1 0-3 pCi/m3 ± 1 SIGMA)

QTR. /YEAR 3rd 2005

| ISOTOPE | MIN. REQ. CL* | ALGONQUIN STA-4 | NYU TOWER STA-5 | CROTON PT STA-27 | U3TRNBLDG STA-94 | MET TOWER STA-95 |
|---|---|---|---|---|---|---|
| Be-7 | | 125.2±11.7 | 112.9±13.16 | 107.5±9.71 | 98±9.85 | 115.8±12.2 |
| K-40 | | <5.07 | **<6.62** | **<3.34** | 30.47±7.54 | 36.06±8.5 |
| Mn-54 | | <0.24 | **<0.43** | <0.28 | <0.71 | <0.69 |
| Co-58 | | <0.91 | <0.97 | <0.49 | <0.8 | <0.49 |
| Fe-59 | | <2.17 | <3.64 | <1.86 | <3.67 | **<2.47** |
| Co-60 | | <0.62 | <1.12 | <0.4 | <0.65 | **<0.54** |
| Zn-65 | | <1.6 | <1.57 | <1.29 | <1.29 | **<1.00** |
| Zr-95 | | <1.13 | <1 | <1.13 | <0.92 | <0.78 |
| Nb-95 | | <1.22 | **<0.87** | <0.85 | <0.75 | <0.64 |
| Ru-103 | | <1.03 | <1.11 | <0.86 | <0.98 | <0.79 |
| Ru-106 | | <5.53 | <6.09 | <3.74 | <5.53 | <5.89 |
| I-131 | | <5.9 | <5.34 | <3.44 | <4.22 | <5.86 |
| Cs-134 | (25.0)* | <0.6 | <0.35 | <0.64 | <0.57 | <0.7 |
| Cs-137 | (30.0)* | <0.37 | <0.62 | <0.3 | <0.34 | <0.49 |
| BaLa-140 | | <3.2 | <5.44 | <3.83 | **<3.19** | **<4.85** |
| Ce-141 | | <1.25 | <0.83 | <0.69 | <1.04 | <1.06 |
| TICe-144 | | <2.12 | <2.05 | <1.33 | <1.97 | <2.25 |
| Ra-226 | | <7.5 | <4.12 | <4.81 | <7.82 | <9.71 |
| AcTh-228 | | <2.03 | <2.39 | <0.74 | <2.07 | <2.55 |
| | | | | | | |

BOLD PRINT INDICATES REPORTED LLD VALUES

* Indicates naturally occurring.
** "Less than" values expressed as Critical Level (Lc), unless otherwise noted.
*** Reported as sample LLD.

# TABLE B-7
## CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES OF AIR PARTICULATE SAMPLES** - 2004
(RESULTS IN UNITS OF 1 0-3 pCi/m3 ± 1 SIGMA)

QTR. /YEAR 3rd 2005

| ISOTOPE | MIN. REQ. CL* | LOVETT STA-22 | ROSETON STA-23 | GRASSY PT STA-29 | PEEKSKILL STA-44 |
|---|---|---|---|---|---|
| Be-7 | | 82.15±8.66 | 113.3±10.92 | 101.1±10.63 | 103.3±9.86 |
| K-40 | | **<3.05** | <5.9 | <5.65 | <3.1 |
| Mn-54 | | <0.31 | <0.52 | <0.34 | <0.35 |
| Co-58 | | <0.34 | <0.81 | <0.34 | <0.5 |
| Fe-59 | | <1.97 | <2.55 | <1.83 | <1.35 |
| Co-60 | | <0.24 | <0.34 | <0.68 | <0.5 |
| Zn-65 | | <1.49 | <1.36 | <1.1 | <1.02 |
| Zr-95 | | <0.73 | <1.07 | **<0.75** | <0.47 |
| Nb-95 | | <1.04 | <0.96 | <0.82 | <0.78 |
| Ru-103 | | <0.69 | <0.47 | <0.61 | <0.88 |
| Ru-106 | | <2.39 | <3.03 | <3.03 | <4.67 |
| I-131 | | <3.95 | <5.79 | <4.96 | <4.95 |
| Cs-134 | (25.0)* | <0.58 | <0.77 | <0.43 | <0.68 |
| Cs-137 | (30.0)* | <0.31 | <0.28 | <0.31 | <0.4 |
| BaLa-140 | | <4.89 | <4.49 | <5.65 | <2.88 |
| Ce-141 | | <0.93 | <1.13 | <0.63 | <1.06 |
| TICe-144 | | <1.37 | <2.34 | <1.05 | <1.47 |
| Ra-226 | | <4.96 | <7.33 | <4.8 | <6.16 |
| AcTh-228 | | <1.16 | <0.86 | <1.37 | <1.68 |
| | | | | | |

BOLD PRINT INDICATES REPORTED LLD VALUES

* Indicates naturally occurring.
** "Less than" values expressed as Critical Level (Lc), unless otherwise noted.
*** Reported as sample LLD.

# TABLE B-7
# CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES OF AIR PARTICULATE SAMPLES** - 2004
## (RESULTS IN UNITS OF 1 0-3 pCi/m3 ± 1 SIGMA)

**REPORTING UNITS IN: pCi/m3(x10-3)** **4TH QTR 2005**

| ISOTOPE | MIN. REQ. CL* | ALGONQUIN STA-4 | NYU TOWER STA-5 | CROTON PT STA-27 | U3TRNBLDG STA-94 | MET TOWER STA-95 |
|---|---|---|---|---|---|---|
| Be-7 | | 85.46±13.12 | 55.5±10.25 | 68.25±10.23 | 53.49±9.52 | 60.47±8.54 |
| K-40 | | <6.91 | **<5.95** | <7.03 | <5.01 | **<4.57** |
| Mn-54 | | <0.48 | <0.33 | <0.49 | <0.62 | <0.28 |
| Co-58 | | <1.19 | <0.82 | <1 | <0.58 | <0.52 |
| Fe-59 | | <4.31 | **<2.83** | <3.14 | <3.13 | <2.65 |
| Co-60 | | **<0.74** | <0.83 | <0.57 | <0.46 | <0.39 |
| Zn-65 | | **<1.40** | <2.08 | <0.82 | <1.31 | <1.13 |
| Zr-95 | | <1.11 | <1.72 | <1.15 | **<0.90** | <0.65 |
| Nb-95 | | <1.3 | <0.83 | <0.84 | <1.2 | **<0.68** |
| Ru-103 | | <0.98 | <1.04 | <0.58 | **<0.50** | <0.58 |
| Ru-106 | | <5.18 | <7.4 | <5.84 | <6.21 | <5.17 |
| I-131 | | <5 | <8.01 | <4.7 | <5.3 | <5.4 |
| Cs-134 | (25.0)* | <0.39 | <0.46 | <0.49 | <0.55 | <0.62 |
| Cs-137 | (30.0)* | <0.59 | <0.53 | <0.34 | <0.52 | <0.24 |
| BaLa-140 | | **<7.15** | <4.87 | <5.47 | <4.81 | **<4.35** |
| Ce-141 | | <1.33 | <1.43 | <1.21 | <0.98 | <1.13 |
| TICe-144 | | <2.37 | <2.13 | <1.77 | <1.66 | <1.57 |
| Ra-226 | | <6 | <7.46 | <9.21 | <4.52 | <5.39 |
| AcTh-228 | | **<1.88** | <2.27 | <1.8 | <1.15 | <2.28 |
| | | | | | | |

**BOLD PRINT INDICATES REPORTED LLD VALUES**

* Indicates naturally occurring.
** "Less than" values expressed as Critical Level (Lc), unless otherwise noted.
*** Reported as sample LLD.

# TABLE B-7
# CONCENTRATIONS OF GAMMA EMITTERS IN QUARTERLY COMPOSITES OF AIR PARTICULATE SAMPLES** - 2004
(RESULTS IN UNITS OF 1 0-3 pCi/m3 ± 1 SIGMA)

4TH QTR 2005

| ISOTOPE | MIN. REQ. CL* | LOVETT STA-22 | ROSETON STA-23 | GRASSY PT STA-29 | PEEKSKILL STA-44 |
|---|---|---|---|---|---|
| Be-7 | | 67.64±9.41 | 55.16±11.82 | 59.09±6.52 | 55.6±9.7 |
| K-40 | | 31.63±7.53 | **<10.1** | <2.36 | <5.74 |
| Mn-54 | | <0.65 | <0.49 | <0.3 | <0.4 |
| Co-58 | | <0.8 | <1.23 | <0.31 | <0.57 |
| Fe-59 | | <2.55 | **<3.65** | <1.2 | <2.24 |
| Co-60 | | **<0.85** | <0.77 | <0.31 | <0.47 |
| Zn-65 | | **<1.17** | <2.77 | <0.83 | <1.42 |
| Zr-95 | | <0.63 | <1.62 | <0.64 | **<1.15** |
| Nb-95 | | <0.91 | <1.34 | <0.53 | <0.59 |
| Ru-103 | | <0.88 | <0.82 | <0.58 | **<0.82** |
| Ru-106 | | <5.51 | <8.46 | <4.02 | <6.92 |
| I-131 | | <4.91 | <4.84 | <2.77 | <5.58 |
| Cs-134 | (25.0)* | <0.52 | <0.71 | <0.34 | <0.75 |
| Cs-137 | (30.0)* | <0.39 | <0.5 | <0.35 | <0.34 |
| BaLa-140 | | **<3.7** | <8.15 | <3.07 | <4.35 |
| Ce-141 | | <1.36 | <1.11 | <0.6 | <0.99 |
| TlCe-144 | | <2.24 | <2.34 | <1.49 | <1.98 |
| Ra-226 | | <6.43 | <6.21 | <4.85 | <4.72 |
| AcTh-228 | | **<2.2** | <2.58 | <1.6 | <2.08 |
| | | | | | |

BOLD PRINT INDICATES REPORTED LLD VALUES

* Indicates naturally occurring.
** "Less than" values expressed as Critical Level (Lc), unless otherwise noted.
*** Reported as sample LLD.

## TABLE B-8
## I-131 ACTIVITY IN CHARCOAL CARTRIDGE SAMPLES - 2005*

(pCi/m3 ± 1 sigma)

| Week # | End Date | 4 | 5 | 94 | 95 | 23 | 22 | 27 | 29 | 44 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1/4/2005 | < 0.016 | < 0.022 | < 0.011 | < 0.022 | < 0.019 | < 0.021 | < 0.017 | < 0.017 | < 0.022 |
| 2 | 1/11/2005 | < 0.02 | < 0.017 | < 0.02 | < 0.028 | < 0.021 | < 0.019 | < 0.023 | < 0.015 | < 0.016 |
| 3 | 1/18/2005 | < 0.021 | < 0.011 | < 0.022 | < 0.021 | < 0.016 | < 0.015 | < 0.013 | < 0.013 | < 0.02 |
| 4 | 1/26/2005 | < 0.016 | < 0.022 | < 0.022 | < 0.017 | < 0.023 | < 0.041 | < 0.022 | < 0.017 | < 0.031 |
| 5 | 2/1/2005 | < 0.018 | < 0.022 | < 0.023 | < 0.018 | < 0.02 | < 0.014 | < 0.016 | < 0.015 | < 0.018 |
| 6 | 2/8/2005 | < 0.018 | < 0.023 | < 0.024 | < 0.024 | < 0.029 | < 0.02 | < 0.022 | < 0.017 | < 0.028 |
| 7 | 2/15/2005 | < 0.022 | < 0.031 | < 0.014 | < 0.023 | < 0.022 | < 0.021 | < 0.024 | < 0.027 | < 0.035 |
| 8 | 2/22/2005 | < 0.022 | < 0.019 | < 0.02 | < 0.021 | < 0.021 | < 0.014 | < 0.018 | < 0.014 | < 0.023 |
| 9 | 2/28/2005 | < 0.026 | < 0.021 | < 0.024 | < 0.025 | < 0.022 | < 0.021 | < 0.025 | < 0.017 | < 0.025 |
| 10 | 3/8/2005 | < 0.035 | < 0.021 | < 0.018 | < 0.014 | < 0.026 | < 0.019 | < 0.015 | < 0.023 | < 0.024 |
| 11 | 3/14/2005 | < 0.026 | < 0.023 | < 0.028 | < 0.021 | < 0.022 | < 0.013 | < 0.02 | < 0.029 | < 0.021 |
| 12 | 3/22/2005 | < 0.03 | < 0.036 | < 0.037 | < 0.032 | < 0.029 | < 0.037 | < 0.018 | < 0.006 | < 0.032 |
| 13 | 3/29/2005 | < 0.048 | < 0.023 | < 0.016 | < 0.038 | < 0.038 | < 0.035 | < 0.032 | < 0.026 | < 0.032 |
| 14 | 4/5/2005 | < 0.04 | < 0.009 | < 0.026 | < 0.029 | < 0.029 | < 0.021 | < 0.03 | < 0.019 | < 0.027 |
| 15 | 4/12/2005 | < 0.041 | < 0.021 | < 0.007 | < 0.022 | < 0.034 | < 0.017 | < 0.035 | < 0.023 | < 0.024 |
| 16 | 4/19/2005 | < 0.034 | < 0.026 | < 0.035 | < 0.027 | < 0.026 | < 0.026 | < 0.022 | < 0.022 | < 0.024 |
| 17 | 4/26/2005 | < 0.029 | < 0.018 | < 0.026 | < 0.018 | < 0.026 | < 0.017 | < 0.014 | < 0.012 | < 0.024 |
| 18 | 5/3/2005 | < 0.023 | < 0.021 | < 0.012 | < 0.032 | < 0.023 | < 0.025 | < 0.038 | < 0.014 | < 0.019 |
| 19 | 5/10/2005 | < 0.025 | < 0.024 | < 0.027 | < 0.022 | < 0.01 | < 0.022 | < 0.026 | < 0.019 | < 0.034 |
| 20 | 5/17/2005 | < 0.033 | < 0.032 | < 0.028 | < 0.021 | < 0.008 | < 0.011 | < 0.026 | < 0.013 | < 0.024 |
| 21 | 5/24/2005 | < 0.029 | < 0.023 | < 0.024 | < 0.021 | < 0.045 | < 0.02 | < 0.028 | < 0.022 | < 0.028 |
| 22 | 5/31/2005 | < 0.029 | < 0.032 | < 0.008 | < 0.024 | < 0.029 | < 0.022 | < 0.029 | < 0.015 | < 0.028 |
| 23 | 6/6/2005 | < 0.022 | < 0.025 | < 0.022 | < 0.024 | < 0.031 | < 0.0168 | < 0.0162 | < 0.0127 | < 0.0229 |
| 24 | 6/14/2005 | < 0.034 | < 0.029 | < 0.031 | < 0.034 | < 0.031 | < 0.021 | < 0.022 | < 0.025 | < 0.009 |
| 25 | 6/21/2005 | < 0.029 | < 0.042 | < 0.019 | < 0.009 | < 0.031 | < 0.021 | < 0.033 | < 0.018 | < 0.031 |
| 26 | 6/27/2005 | < 0.036 | < 0.03 | < 0.035 | < 0.035 | < 0.025 | < 0.028 | < 0.01 | < 0.016 | < 0.036 |
| 27 | 7/5/2005 | < 0.032 | < 0.025 | < 0.029 | < 0.019 | < 0.022 | < 0.022 | < 0.027 | < 0.026 | < 0.021 |
| 28 | 7/12/2005 | < 0.029 | < 0.032 | < 0.025 | < 0.026 | < 0.028 | < 0.031 | < 0.036 | < 0.021 | < 0.027 |
| 29 | 7/19/2005 | < 0.034 | < 0.027 | < 0.025 | < 0.028 | < 0.039 | < 0.027 | < 0.025 | < 0.031 | < 0.025 |
| 30 | 7/26/2005 | < 0.017 | < 0.03 | < 0.006 | < 0.026 | < 0.03 | < 0.028 | < 0.043 | < 0.022 | < 0.031 |
| 31 | 8/2/2005 | < 0.017 | < 0.025 | < 0.022 | < 0.032 | < 0.025 | < 0.028 | < 0.022 | < 0.018 | < 0.053 |
| 32 | 8/9/2005 | < 0.026 | < 0.024 | < 0.028 | < 0.019 | < 0.03 | < 0.02 | < 0.018 | < 0.024 | < 0.025 |
| 33 | 8/16/2005 | < 0.029 | < 0.02 | < 0.02 | < 0.006 | < 0.032 | < 0.003 | < 0.021 | < 0.017 | < 0.019 |
| 34 | 8/23/2005 | < 0.028 | < 0.02 | < 0.021 | < 0.024 | < 0.022 | < 0.021 | < 0.025 | < 0.025 | < 0.018 |
| 35 | 8/30/2005 | < 0.014 | < 0.02 | < 0.018 | < 0.025 | < 0.025 | < 0.014 | < 0.021 | < 0.017 | < 0.029 |
| 36 | 9/6/2005 | < 0.02 | < 0.016 | < 0.021 | < 0.018 | < 0.024 | < 0.013 | < 0.015 | < 0.014 | < 0.02 |
| 37 | 9/13/2005 | < 0.043 | < 0.024 | < 0.005 | < 0.026 | < 0.049 | < 0.039 | < 0.037 | < 0.021 | < 0.031 |
| 38 | 9/20/2005 | < 0.034 | < 0.009 | < 0.027 | < 0.047 | < 0.034 | < 0.014 | < 0.022 | < 0.022 | < 0.024 |
| 39 | 9/27/2005 | < 0.026 | < 0.024 | < 0.031 | < 0.021 | < 0.044 | < 0.025 | < 0.027 | < 0.016 | < 0.027 |
| 40 | 10/4/2005 | < 0.04 | < 0.025 | < 0.027 | < 0.042 | < 0.029 | < 0.018 | < 0.028 | < 0.018 | < 0.033 |
| 41 | 10/11/2005 | < 0.027 | < 0.023 | < 0.017 | < 0.04 | < 0.024 | < 0.022 | < 0.024 | < 0.019 | < 0.029 |
| 42 | 10/18/2005 | < 0.024 | < 0.024 | < 0.024 | < 0.04 | < 0.027 | < 0.023 | < 0.031 | < 0.02 | < 0.039 |
| 43 | 10/25/2005 | < 0.024 | < 0.016 | < 0.013 | < 0.034 | < 0.026 | < 0.023 | < 0.043 | < 0.034 | < 0.025 |
| 44 | 11/1/2005 | < 0.033 | < 0.023 | < 0.021 | < 0.043 | < 0.022 | < 0.015 | < 0.005 | < 0.022 | < 0.022 |
| 45 | 11/8/2005 | < 0.028 | < 0.023 | < 0.019 | < 0.027 | < 0.035 | < 0.052 | < 0.03 | < 0.019 | < 0.033 |
| 46 | 11/15/2005 | < 0.03 | < 0.022 | < 0.008 | < 0.022 | < 0.03 | < 0.034 | < 0.024 | < 0.015 | < 0.027 |
| 47 | 11/21/2005 | < 0.027 | < 0.028 | < 0.021 | < 0.032 | < 0.023 | < 0.025 | < 0.033 | < 0.019 | < 0.034 |
| 48 | 11/29/2005 | < 0.007 | < 0.023 | < 0.021 | < 0.012 | < 0.034 | < 0.023 | < 0.021 | < 0.026 | < 0.026 |
| 49 | 12/5/2005 | < 0.023 | < 0.033 | < 0.022 | < 0.037 | < 0.026 | < 0.024 | < 0.036 | < 0.015 | < 0.018 |
| 50 | 12/13/2005 | < 0.025 | < 0.07 | < 0.019 | < 0.035 | < 0.047 | < 0.018 | < 0.018 | < 0.035 | < 0.024 |
| 51 | 12/20/2005 | < 0.045 | < 0.059 | < 0.013 | < 0.033 | < 0.026 | < 0.041 | < 0.025 | < 0.031 | < 0.03 |
| 52 | 12/27/2005 | < 0.031 | < 0.034 | < 0.035 | < 0.04 | < 0.028 | < 0.02 | < 0.021 | < 0.016 | < 0.028 |
| 53 | 1/4/2006 | < 0.021 | < 0.0446 | < 0.0423 | < 0.0311 | < 0.0224 | < 0.0217 | < 0.0325 | < 0.0066 | < 0.03 |

* "Less than" values expressed as sample Critical Level ($L_c$) unless otherwise noted.

## TABLE B-9

## CONCENTRATIONS OF GAMMA EMMITERS IN HUDSON RIVER WATER SAMPLES** - 2005

(pCi/L ± 1 SIGMA)

### #9 PLANT INLET (HUDSON RIVER INTAKE)

| Radionuclide | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7* | <11.35 | <11.49 | <16.18 | <15.47 | <12.36 | <13.08 |
| K-40* | 199.5±13.48 | 210.9±17.03 | 172±21.99 | 400±22.24 | 375.9±17.82 | 167.4±15.4 |
| Mn-54 | <1.09 | <1.31 | <1.56 | <1.55 | <1.25 | <1.28 |
| Co-58 | <1.24 | <1.57 | <2.2 | <1.72 | <1.36 | <1.6 |
| Fe-59 | <3.61 | <4.71 | <5.68 | <4.88 | <3.87 | <4.61 |
| Co-60 | <1.09 | <1.55 | <2 | <1.59 | <1.14 | <1.38 |
| Zn-65 | <2.44 | <3.21 | <4.17 | <2.48 | <1.84 | <2.89 |
| Zr-95 | <2.26 | <2.84 | <3.83 | <2.73 | <2.43 | <2.92 |
| Nb-95 | <1.53 | <1.85 | <2.06 | <1.87 | <1.66 | <1.94 |
| Ru-103 | <1.6 | <0.99 | <2.47 | <2.21 | <1.67 | <1.92 |
| Ru-106 | <9.9 | <13.31 | <16.06 | <17.85 | <13.57 | <16.21 |
| I-131 | <6.35 | <5.57 | <6.45 | <7.01 | <4.81 | <5.47 |
| Cs-134 | <1.02 | <1.24 | <1.42 | <1.73 | <1.31 | <1.5 |
| Cs-137 | <0.95 | <1.22 | <1.73 | <1.56 | <1.28 | <1.2 |
| Ba/La-140 | <3.93 | <4.68 | <6.53 | <6.35 | <3.62 | <4.12 |
| Ce-141 | <2.66 | <2.4 | <3.14 | <3.56 | <2.8 | <2.85 |
| Ce-144 | <7.38 | <6.97 | <10.1 | <11 | <8.41 | <9.15 |
| Ra-226* | 71.56±20.36 | 193.8±20.99 | 144.5±28.04 | 102.3±27.89 | 94.14±21.15 | 44.03±22.35 |
| Ac/Th-228* | <3.31 | 6.97±3.24 | <6.78 | <5.18 | 9.79±3.09 | <4.43 |

### #10 DISCHARGE CANAL (MIXING ZONE)

| Radionuclide | January | February | March | April | May | June |
|---|---|---|---|---|---|---|
| Be-7* | <12.23 | <6.78 | <14.44 | <14.87 | <9.04 | <11.1 |
| K-40* | 387.3±18.61 | 287.7±8.93 | 192.6±17.87 | 206.3±23.86 | 286.8±11.57 | 124.1±14.01 |
| Mn-54 | <1.21 | <0.73 | <1.45 | <1.53 | <0.9 | <1.05 |
| Co-58 | <1.39 | <0.81 | <1.54 | <1.98 | <1.09 | <1.48 |
| Fe-59 | <4.17 | <2.17 | <4.15 | <4.99 | <2.87 | <3.55 |
| Co-60 | <1.34 | <0.66 | <1.3 | <2 | <0.89 | <1.24 |
| Zn-65 | <1.9 | <0.91 | <2.82 | <4.48 | <1.09 | <2.69 |
| Zr-95 | <2.29 | <1.42 | <2.62 | <3.68 | <1.95 | <2.03 |
| Nb-95 | <1.7 | <0.99 | <2.02 | <2.96 | <1.3 | <1.77 |
| Ru-103 | <1.01 | <1.03 | <1.98 | <2.5 | <1.35 | <1.82 |
| Ru-106 | <12.85 | <7.38 | <12.42 | <17.3 | <9.6 | <13.24 |
| I-131 | <6.96 | <3.31 | <6.08 | <7.85 | <4.11 | <5.38 |
| Cs-134 | <0.88 | <0.48 | <1.43 | <1.57 | <0.61 | <0.8 |
| Cs-137 | <1.25 | <0.66 | <1.36 | <1.7 | <0.91 | <1.09 |
| Ba/La-140 | <5.42 | <1.93 | <5.22 | <7.16 | <2.69 | <4.29 |
| Ce-141 | <3.02 | <1.82 | <3.24 | <3.26 | <2.38 | <2.33 |
| Ce-144 | <8.40 | <5.86 | <10.4 | <7.68 | <7.6 | <7.15 |
| Ra-226* | 85.02±22.28 | 86.43±12.8 | 75.17±27.49 | 188.7±27.37 | 74.66±15.88 | 122.8±19.28 |
| Ac/Th-228* | 10.16±3.36 | 11.62±1.85 | <4.41 | 9.25±4.38 | 15.81±2.65 | <4.21 |

* Indicates naturally occurring.

** "Less than" values expressed as Critical Level ($L_c$).

## TABLE B-9

## CONCENTRATIONS OF GAMMA EMMITERS IN HUDSON RIVER WATER SAMPLES** - 2005

(pCi/L ± 1 SIGMA)

### #9 PLANT INLET (HUDSON RIVER INTAKE)

| Radionuclide | July | August | September | October | November | December |
|---|---|---|---|---|---|---|
| Be-7* | <12.75 | <13.78 | <13.74 | <14.19 | <14.64 | <11.49 |
| K-40* | 390.6±18.6 | 171.2±16.08 | 234.1±19.65 | 162.7±16.18 | 135.7±15.56 | 361.5±14.63 |
| Mn-54 | <1.36 | <1.34 | <1.49 | <1.4 | <1.4 | <1.14 |
| Co-58 | <1.44 | <1.45 | <1.55 | <1.64 | <1.79 | <1.21 |
| Fe-59 | <4.52 | <4.15 | <5.42 | <4.5 | <4.37 | <3.48 |
| Co-60 | <1.36 | <1.36 | <1.64 | <1.49 | <1.41 | <1.04 |
| Zn-65 | <3.05 | <3.01 | <3.5 | <1.82 | <3.43 | <2.75 |
| Zr-95 | <2.37 | <2.45 | <2.82 | <2.52 | <2.49 | <2.26 |
| Nb-95 | <1.59 | <1.81 | <2.17 | <1.82 | <2.08 | <1.5 |
| Ru-103 | <1.93 | <2.06 | <2.04 | <2.04 | <1.99 | <1.69 |
| Ru-106 | <13.46 | <14.17 | <15.3 | <15.54 | <15.95 | <10.12 |
| I-131 | <6 | <5.74 | <7.08 | <6.14 | <6.95 | <5.52 |
| Cs-134 | <0.92 | <1.63 | <1.49 | <1.66 | <1.51 | <0.71 |
| Cs-137 | <1.22 | <1.3 | <1.31 | <1.49 | <1.51 | <0.99 |
| Ba/La-140 | <4.3 | <4.37 | <5.78 | <4.56 | <5.87 | <3.95 |
| Ce-141 | <2.88 | <2.88 | <3.06 | <3.57 | <2.49 | <2.65 |
| Ce-144 | <8.67 | <9.21 | <92.1 | <11.2 | <10.9 | <7.68 |
| Ra-226* | 102±21.26 | 77.01±21.87 | 81.91±22.64 | 41.53±24.28 | 61.56±22.49 | 114.5±16.9 |
| Ac/Th-228* | 16.59±3.57 | <5.1 | 8.31±3.78 | 15.65±4.23 | <5.16 | 10.13±3.01 |

### #10 DISCHARGE CANAL (MIXING ZONE)

| Radionuclide | July | August | September | October | November | December |
|---|---|---|---|---|---|---|
| Be-7* | <14.6 | <8.94 | <14.63 | <12.48 | <12.43 | <10.67 |
| K-40* | 252.4±20.37 | 122.8±11.26 | 230.7±18.67 | 197.7±17.12 | 105.1±14.03 | 149±10.99 |
| Mn-54 | <1.48 | <0.95 | <1.54 | <1.33 | <1.08 | <0.97 |
| Co-58 | <1.83 | <1.17 | <1.36 | <1.39 | <1.47 | <1.27 |
| Fe-59 | <5.97 | <3.24 | <4.8 | <4.08 | <4.12 | <3.03 |
| Co-60 | <1.86 | <1.05 | <1.46 | <1.34 | <1.17 | <0.98 |
| Zn-65 | <2.35 | <2.18 | <3.34 | <1.88 | <3.09 | <2.58 |
| Zr-95 | <3.21 | <2.19 | <2.93 | <2.66 | <2.46 | <1.87 |
| Nb-95 | <2.35 | <1.45 | <1.85 | <2.04 | <1.67 | <1.57 |
| Ru-103 | <2.07 | <1.59 | <2.16 | <1.98 | <1.69 | <1.52 |
| Ru-106 | <13.83 | <10.18 | <16.38 | <12.26 | <13.93 | <10.43 |
| I-131 | <7.11 | <6.41 | <6.31 | <5.63 | <5.72 | <5.13 |
| Cs-134 | <1.33 | <0.89 | <1.8 | <1.38 | <1.27 | <0.77 |
| Cs-137 | <1.37 | <0.82 | <1.27 | <1.18 | <1.24 | <0.98 |
| Ba/La-140 | <5.58 | <3.6 | <4.57 | <3.59 | <4.55 | <3.87 |
| Ce-141 | <2.92 | <2.05 | <3.61 | <3.17 | <2.86 | <2.64 |
| Ce-144 | <8.69 | <5.82 | <10.8 | <9.38 | <7.69 | <7.73 |
| Ra-226* | 130.1±22.7 | 124±16.84 | 83.18±25.47 | <33.15 | 126.6±24.65 | 66.94±16.1 |
| Ac/Th-228* | 10.17±4.11 | <3.47 | <4.49 | <4.25 | 6.92±3.38 | 5.46±2.47 |

* Indicates naturally occurring.

** "Less than" values expressed as Critical Level ($L_c$).

## TABLE B-10

## CONCENTRATION OF TRITIUM IN HUDSON RIVER WATER SAMPLES*- 2005 (QUARTERLY COMPOSITES)

(pCi/L ± 1 sigma)

**#9 PLANT INLET (HUDSON RIVER INTAKE)**
**(Control Location)**

| Radionuclide | 1ST Quarter | 2ND Quarter | 3RD Quarter | 4TH Quarter |
|---|---|---|---|---|
| TRITIUM 2004 | <413 | <424 | <421 | <471 |

**#10 DISCHARGE CANAL (MIXING ZONE)**

| Radionuclide | 1ST Quarter | 2ND Quarter | 3RD Quarter | 4TH Quarter |
|---|---|---|---|---|
| TRITIUM 2004 | 618 ± 130 | <424 | <421 | <471 |

* "Less than" values expressed as Critical Level ($L_c$).

# TABLE B-11
# GROSS BETA ACTIVITY AND CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES - 2005

## INDIAN POINT SUMMARY SHEET

**SAMPLE TYPE: Drinking Water** **REPORTING UNITS IN: pCi/L ± 1 sigma** **MONTH / YEAR: JANUARY 2005**

| ISOTOPE | MIN. REQ. CL* | CAMP FIELD RES. | NEW CROTON RES. | AMICUS RES. | 5TH STREET WELL |
|---|---|---|---|---|---|
| Gross Beta | LLD = 4.0 | 2.452 ± 0.449 | 3.306 ± 0.476 | 6.458 ± 0.583 | 4.413 ± 0.505 |
| Be-7 | | <28.52 | <14.2 | <28.33 | <26.83 |
| K-40 | | 216.1±40.33 | 142.8±25.94 | 160.8±29.99 | 412.4±46.1 |
| Mn-54 | (7.5*) | <3.27 | <1.87 | <2.94 | <3.68 |
| Co-58 | (7.5*) | <3 | <2.05 | <3.33 | <3.84 |
| Fe-59 | (15*) | <6.3 | <6.08 | <7.17 | <9.97 |
| Co-60 | (7.5*) | <3.43 | <2.29 | <2.73 | <2.92 |
| Zn-65 | (15*) | <7.76 | <5.35 | <3.88 | <6.54 |
| Zr-95 | (7.5*) | <5.46 | <4.71 | <5.59 | <6.47 |
| Nb-95 | (7.5*) | <2.78 | <2.43 | <2.38 | <2.47 |
| Ru-103 | | <2.43 | <2.86 | <3.38 | <3.7 |
| Ru-106 | | <34.48 | <24.74 | <30.55 | <40.39 |
| I-131 | (0.5*) | <0.19 | <.183 | <.212 | <.262 |
| Cs-134 | (7.5*) | <3.35 | <2.61 | <3.63 | <2.7 |
| Cs-137 | (9.0*) | <3.14 | <2.11 | <2.07 | <4.08 |
| Ba/La-140 | (7.5*) | <2.17 | <4.01 | <4.1 | <4.41 |
| Ce-141 | | <4.38 | <3.62 | <6.01 | <6.43 |
| Ce-144 | | <19.2 | <15.9 | <26.5 | <27.2 |
| Ra-226 | | 175.1±51.58 | <47.48 | <92.14 | <78.06 |
| Ac-228 | | <9.93 | <8.82 | <13.09 | <12.05 |
| H-3 | | | | | |
| | | | | | |

**Results reported as < are CL values**

# TABLE B-11
# GROSS BETA ACTIVITY AND CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES - 2005

## INDIAN POINT SUMMARY SHEET

**SAMPLE TYPE: Drinking Water** **REPORTING UNITS IN: pCi/L ± 1 sigma** **FEBRUARY 2005**

| ISOTOPE | MIN. REQ. CL* | CAMP FIELD RES. | NEW CROTON RES. | AMICUS RES. | 5TH STREET WELL |
|---|---|---|---|---|---|
| Gross Beta | LLD = 4.0 | 2.71 ± 0.48 | 3.09 ± 0.49 | 2.23 ± 0.46 | 7.88 ± 0.63 |
| Be-7 | | <26.66 | <19.47 | <17.29 | <19.77 |
| K-40 | | 193±36.6 | 183.3±31.4 | 154±26.98 | <25.28 |
| Mn-54 | (7.5*) | <2.75 | <2.5 | <2.17 | <2.62 |
| Co-58 | (7.5*) | <2.98 | <2.7 | <2.28 | <2.5 |
| Fe-59 | (15*) | <8.9 | <5.46 | <3.83 | <6.31 |
| Co-60 | (7.5*) | <3.83 | <1.66 | <2.02 | <3.05 |
| Zn-65 | (15*) | <8.13 | <3.52 | <4.39 | <2.43 |
| Zr-95 | (7.5*) | <3.98 | <3.76 | <4.6 | <4.16 |
| Nb-95 | (7.5*) | <2.66 | <2.29 | <2.68 | <2 |
| Ru-103 | | <3.1 | <2.62 | <2.6 | <2.64 |
| Ru-106 | | <27.13 | <18.51 | <27.08 | <21.07 |
| I-131 | (0.5*) | <0.76 | <0.71 | <0.64 | <0.77 |
| Cs-134 | (7.5*) | <3.19 | <2.37 | <2.48 | <2.62 |
| Cs-137 | (9.0*) | <2.64 | <2.06 | <2.32 | <2.77 |
| Ba/La-140 | (7.5*) | <2.65 | <2.73 | <2.04 | <3.42 |
| Ce-141 | | <4.98 | <3.66 | <3.69 | <4.23 |
| Ce-144 | | <16.90 | <15.90 | <16.80 | <18.20 |
| Ra-226 | | 129.6±54.52 | <53.83 | 125.8±45.72 | <62.35 |
| Ac-228 | | <11.64 | <6.66 | <10.56 | <10.04 |
| H-3 | | | | | |
| | | | | | |

**Results reported as < are CL values**

I-131 CL's not met due to sample decay time. Deviation forms on file.

# TABLE B-11
# GROSS BETA ACTIVITY AND CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES - 2005

## INDIAN POINT SUMMARY SHEET

**SAMPLE TYPE:** Drinking Water **REPORTING UNITS IN:** pCi/L ± 1 sigma **March-05**

| ISOTOPE | MIN. REQ. CL* | CAMP FIELD RES. | NEW CROTON RES. | AMICUS RES. | 5TH STREET WELL |
|---|---|---|---|---|---|
| Gross Beta | LLD = 4.0 | 1.18 ± 0.40 | 2.62 ± 0.51 | 2.40 ± 0.49 | 4.69 ± 0.55 |
| Be-7 | | <30.24 | <22.62 | <32.58 | <31.04 |
| K-40 | | <39.41 | <39.08 | 414.5±56.59 | 260.2±41.09 |
| Mn-54 | (7.5*) | <2.69 | <3.79 | <3.88 | <3.69 |
| Co-58 | (7.5*) | <2.82 | <1.89 | <4.33 | <4.46 |
| Fe-59 | (15*) | <8.05 | <4.37 | <10.66 | <9.65 |
| Co-60 | (7.5*) | <3.15 | <1.64 | <2.8 | <3.84 |
| Zn-65 | (15*) | <8.16 | <5.22 | <11.17 | <4.17 |
| Zr-95 | (7.5*) | <6.2 | <3.24 | <5.58 | <6.64 |
| Nb-95 | (7.5*) | <3.25 | <3.45 | <4.02 | <3.33 |
| Ru-103 | | <3.15 | <4.42 | <3.99 | <4.05 |
| Ru-106 | | <37.08 | <27.65 | <37.12 | <40.3 |
| I-131 | (0.5*) | <0.30 | <0.30 | <0.31 | <0.36 |
| Cs-134 | (7.5*) | <3.92 | <3.19 | <2.41 | <2.93 |
| Cs-137 | (9.0*) | <3.62 | <1.61 | <4.52 | <3.46 |
| Ba/La-140 | (7.5*) | <3.05 | <6.11 | <6.02 | <2.59 |
| Ce-141 | | <5.3 | <4.33 | <6.17 | <7.89 |
| Ce-144 | | <19.10 | <19.10 | <28.80 | <33.40 |
| Ra-226 | | <76.37 | 105.5±60.65 | <82.43 | <101.7 |
| Ac-228 | | <9.37 | <10.54 | <14.34 | <12.75 |
| H-3 | | | | | |
| | | | | | |

**Results reported as < are CL values**

# TABLE B-11
# GROSS BETA ACTIVITY AND CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES - 2005

## INDIAN POINT SUMMARY SHEET

**SAMPLE TYPE:** Drinking Water **REPORTING UNITS IN:** pCi/L ± 1 sigma **Apr-05**

| ISOTOPE | MIN. REQ. CL* | CAMP FIELD RES. | NEW CROTON RES. | AMICUS RES. | 5TH STREET WELL |
|---|---|---|---|---|---|
| Gross Beta | LLD = 4.0 | 1.11 ± 0.50 | 2.51 ± 0.57 | 5.61 ± 0.63 | 5.83 ± 0.62 |
| Be-7 | | <30.35 | <25.7 | <33.6 | <34.52 |
| K-40 | | 311.6±41.67 | <34.83 | 163±39.31 | 486.4±57.53 |
| Mn-54 | (7.5*) | <3.15 | <3.53 | <3.72 | <4.75 |
| Co-58 | (7.5*) | <3.15 | <2.98 | <3.94 | <4.89 |
| Fe-59 | (15*) | <8.26 | <4.36 | <8.62 | <11.98 |
| Co-60 | (7.5*) | <3.37 | <3.26 | <4.27 | <5.14 |
| Zn-65 | (15*) | <8.43 | <5.2 | <4.37 | <5.95 |
| Zr-95 | (7.5*) | <4.69 | <3.95 | <6.2 | <5.77 |
| Nb-95 | (7.5*) | <3.36 | <3.67 | <2.09 | <3.77 |
| Ru-103 | | <3.27 | <3.82 | <3.84 | <4.82 |
| Ru-106 | | <32.43 | <29.78 | <31.41 | <39.36 |
| I-131 | (0.5*) | <0.28 | <0.22 | <0.22 | <0.20 |
| Cs-134 | (7.5*) | <2.28 | <3.73 | <4.99 | <3.18 |
| Cs-137 | (9.0*) | <2.5 | <2.27 | <4.08 | <4.15 |
| Ba/La-140 | (7.5*) | <2.98 | <2.48 | <4.86 | <5.81 |
| Ce-141 | | <5.67 | <5.38 | <7.09 | <7.3 |
| Ce-144 | | <26.20 | <22.00 | <29.30 | <33.20 |
| Ra-226 | | <80.2 | <76.46 | <116.6 | 159.7±81.12 |
| Ac-228 | | <9.97 | <16.29 | <14.87 | <16.21 |
| H-3 | | | | | |
| | | | | | |

**Results reported as < are CL values**

# TABLE B-11
# GROSS BETA ACTIVITY AND CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES - 2005

## INDIAN POINT SUMMARY SHEET

**SAMPLE TYPE: Drinking Water** **REPORTING UNITS IN: pCi/L ± 1 sigma** **May-05**

| ISOTOPE | MIN. REQ. CL* | CAMP FIELD RES. | NEW CROTON RES. | AMICUS RES. | 5TH STREET WELL |
|---|---|---|---|---|---|
| Gross Beta | LLD = 4.0 | 2.55 ± 0.46 | 2.80 ± 0.44 | 2.49 ± 0.45 | 7.70 ± 0.58 |
| Be-7 | | <24.62 | <20.89 | <24.07 | <30.27 |
| K-40 | | 264.4±39.15 | 222.9±29.82 | 347.2±57.4 | 189.9±36.57 |
| Mn-54 | (7.5*) | <3.24 | <2.39 | <4.25 | <3.16 |
| Co-58 | (7.5*) | <3.43 | <2.05 | <3.79 | <3.58 |
| Fe-59 | (15*) | <7.04 | <5.2 | <7.81 | <10.3 |
| Co-60 | (7.5*) | <3.2 | <2.35 | <4.33 | <3.95 |
| Zn-65 | (15*) | <7.45 | <6.59 | <12.9 | <3.51 |
| Zr-95 | (7.5*) | <5.58 | <4.72 | <5.59 | <6.49 |
| Nb-95 | (7.5*) | <3.53 | <2.94 | <3.99 | <2.45 |
| Ru-103 | | <3.49 | <2.43 | <3.69 | <3.45 |
| Ru-106 | | <30.13 | <28.06 | <32.86 | <39.01 |
| I-131 | (0.5*) | <0.28 | <0.21 | <0.23 | <0.20 |
| Cs-134 | (7.5*) | <2.51 | <3.3 | <5.18 | <3.49 |
| Cs-137 | (9.0*) | <2.94 | <3.09 | <4.88 | <3.93 |
| Ba/La-140 | (7.5*) | <4.93 | <3.6 | <3.03 | <3.71 |
| Ce-141 | | <5.62 | <4.77 | <6.88 | <6.29 |
| Ce-144 | | <26.30 | <20.80 | <29.00 | <26.60 |
| Ra-226 | | 132.3±54.67 | 193.2±51.22 | <87.28 | <101.1 |
| Ac-228 | | <10.84 | <6.94 | <13.71 | <11.39 |
| H-3 | | | | | |
| | | | | | |

**Results reported as < are CL values. Bold numbers are LLD values.**

# TABLE B-11
# GROSS BETA ACTIVITY AND CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES - 2005

## INDIAN POINT SUMMARY SHEET

**SAMPLE TYPE: Drinking Water** **REPORTING UNITS IN: pCi/L ± 1 sigma** **Jun-05**

| ISOTOPE | MIN. REQ. CL* | CAMP FIELD RES. | NEW CROTON RES. | AMICUS RES. | 5TH STREET WELL |
|---|---|---|---|---|---|
| Gross Beta | LLD = 4.0 | 2.08 ± 0.49 | 2.89 ± 0.51 | 2.37 ± 0.47 | 5.85 ± 0.60 |
| Be-7 | | <27.67 | <19.11 | <23.61 | <29.96 |
| K-40 | | <34.85 | 416.9±45.92 | 262.7±39.8 | 257.7±38.23 |
| Mn-54 | (7.5*) | <4.66 | <3.23 | <3.46 | <3.33 |
| Co-58 | (7.5*) | <3.28 | <2.52 | <3.17 | <4.59 |
| Fe-59 | (15*) | <8.52 | <8.17 | <7.01 | <7.46 |
| Co-60 | (7.5*) | <3.26 | <2.75 | <2.82 | <3.52 |
| Zn-65 | (15*) | <8.51 | <9.32 | <5.9 | <3.87 |
| Zr-95 | (7.5*) | <5.11 | <5.51 | <5.48 | <5.57 |
| Nb-95 | (7.5*) | <3.68 | <2.9 | <3.91 | <2.58 |
| Ru-103 | | <4.07 | <2.84 | <3.75 | <3.49 |
| Ru-106 | | <29.82 | <37.43 | <27.87 | <33.78 |
| I-131 | (0.5*) | <0.50 | <0.46 | <0.40 | <0.45 |
| Cs-134 | (7.5*) | <3.56 | <3.48 | <1.99 | <2.35 |
| Cs-137 | (9.0*) | <2.54 | <3.39 | <2.5 | <3.38 |
| Ba/La-140 | (7.5*) | <4.99 | <2.96 | <4.9 | <4.23 |
| Ce-141 | | <4.83 | <4.83 | <6.34 | <7.31 |
| Ce-144 | | <20.60 | <19.80 | <24.00 | <31.10 |
| Ra-226 | | <84.06 | 134.4±51.28 | <82.87 | <95.72 |
| Ac-228 | | <15.61 | <10.71 | <10.01 | <13.41 |
| H-3 | | | | | |
| | | | | | |

**Results reported as < are CL values**

# TABLE B-11
# GROSS BETA ACTIVITY AND CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES - 2005

## INDIAN POINT SUMMARY SHEET

**SAMPLE TYPE:** Drinking Water **REPORTING UNITS IN:** pCi/L ± 1 sigma **Jul-05**

| ISOTOPE | MIN. REQ. CL* | CAMP FIELD RES. | NEW CROTON RES. | AMICUS RES. | 5TH STREET WELL |
|---|---|---|---|---|---|
| Gross Beta | LLD = 4.0 | 2.57 ± 0.54 | 2.53 ± 0.52 | 7.10 ± 0.65 | 6.99 ± 0.64 |
| Be-7 | | <26.14 | <20.66 | <28.47 | <22.63 |
| K-40 | | 181.9±44.43 | 137.3±28.96 | 191.3±33.97 | 155.3±31.99 |
| Mn-54 | (7.5*) | <3.73 | <2.74 | <2.98 | <3.16 |
| Co-58 | (7.5*) | <1.99 | <2.12 | <3.04 | <2.84 |
| Fe-59 | (15*) | <8.95 | <6.56 | <6.51 | <9.02 |
| Co-60 | (7.5*) | <2.91 | <2.82 | <4.07 | <3.28 |
| Zn-65 | (15*) | <5.63 | <4.79 | <4.35 | <3.7 |
| Zr-95 | (7.5*) | <4.78 | <5.39 | <4.66 | <4.58 |
| Nb-95 | (7.5*) | <1.93 | <2.75 | <1.84 | <2.29 |
| Ru-103 | | <3.61 | <2.93 | <3.53 | <2.71 |
| Ru-106 | | <37.23 | <24.48 | <31.18 | <23.31 |
| I-131 | (0.5*) | <0.67 | <0.60 | <0.41 | <0.36 |
| Cs-134 | (7.5*) | <2.7 | <3.02 | <3.55 | <2.99 |
| Cs-137 | (9.0*) | <2.74 | <2.87 | <3.34 | <3.27 |
| Ba/La-140 | (7.5*) | <3.68 | <3.29 | <3.01 | <3.73 |
| Ce-141 | | <5.45 | <4.2 | <5.63 | <4.8 |
| Ce-144 | | <20.90 | <17.80 | <23.40 | <21.90 |
| Ra-226 | | 110.6±62.23 | 93.67±46.92 | <94.11 | <71.86 |
| Ac-228 | | <11.14 | <8.31 | <11.92 | <13.57 |
| H-3 | | | | | |
| | | | | | |

**Results reported as < are CL values**

# TABLE B-11
# GROSS BETA ACTIVITY AND CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES - 2005

## INDIAN POINT SUMMARY SHEET

**SAMPLE TYPE:** Drinking Water **REPORTING UNITS IN:** pCi/L ± 1 sigma **Aug-05**

| ISOTOPE | MIN. REQ. CL* | CAMP FIELD RES. | NEW CROTON RES. | AMICUS RES. | 5TH STREET WELL |
|---|---|---|---|---|---|
| Gross Beta | LLD = 4.0 | 2.99 ± 0.53 | 1.58 ± 0.47 | 2.42 ± 0.50 | 7.34 ± 0.64 |
| Be-7 | | <18.02 | <18.58 | <17.17 | <25.95 |
| K-40 | | 140.6±27.63 | 262.5±35.81 | <19.58 | 386.9±46.51 |
| Mn-54 | (7.5*) | <2.24 | <2.15 | <2.32 | <3.56 |
| Co-58 | (7.5*) | <2.55 | <2.73 | <1.34 | <3.22 |
| Fe-59 | (15*) | <6.97 | <3.99 | <7.26 | <9.04 |
| Co-60 | (7.5*) | <2.44 | <2.79 | <3.06 | <3.88 |
| Zn-65 | (15*) | <5.05 | <5.26 | <4.77 | <5.17 |
| Zr-95 | (7.5*) | <4.35 | <5.78 | <4.13 | <5.9 |
| Nb-95 | (7.5*) | <2.75 | <2.66 | <2.16 | <4.09 |
| Ru-103 | | <2.54 | <2.5 | <2.67 | <3.25 |
| Ru-106 | | <26.55 | <27.58 | <18.75 | <30.06 |
| I-131 | (0.5*) | <0.232 | <0.227 | <0.214 | <0.205 |
| Cs-134 | (7.5*) | <1.78 | <2.11 | <2.39 | <2.43 |
| Cs-137 | (9.0*) | <2.61 | <2.93 | <2.21 | <4.01 |
| Ba/La-140 | (7.5*) | <3.74 | <3.89 | <3.52 | <4.88 |
| Ce-141 | | <3.71 | <3.9 | <3.15 | <5.87 |
| Ce-144 | | <1.08 | <0.962 | <0.872 | <0.684 |
| Ra-226 | | <59.75 | <57.5 | 151±40.92 | <83.73 |
| Ac-228 | | <7.29 | <10.24 | <8.52 | <11.9 |
| H-3 | | | | | |
| | | | | | |

**Results reported as < are CL values**

# TABLE B-11
# GROSS BETA ACTIVITY AND CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES - 2005

## INDIAN POINT SUMMARY SHEET

**SAMPLE TYPE:** Drinking Water **REPORTING UNITS IN:** pCi/L ± 1 sigma **Sep-05**

| ISOTOPE | MIN. REQ. CL* | CAMP FIELD RES. | NEW CROTON RES. | AMICUS RES. | 5TH STREET WELL |
|---|---|---|---|---|---|
| Gross Beta | LLD = 4.0 | 3.06 ± 0.45 | 2.40 ± 0.44 | 3.97 ± 0.48 | Sample not available. See deviation Table B-1c |
| Be-7 | | <32.19 | <19.26 | <29.02 | |
| K-40 | | 145.1±50.42 | <38.46 | 365±56.38 | |
| Mn-54 | (7.5*) | <3.39 | <3.36 | <3.74 | |
| Co-58 | (7.5*) | <3.38 | <2.79 | <3.61 | |
| Fe-59 | (15*) | <8.14 | <6.08 | <6.28 | |
| Co-60 | (7.5*) | <3.5 | <1.97 | <4.26 | |
| Zn-65 | (15*) | <7.83 | <6.63 | <9.32 | |
| Zr-95 | (7.5*) | <4.7 | <5.51 | <6.07 | |
| Nb-95 | (7.5*) | <4.02 | <3.62 | <3.24 | |
| Ru-103 | | <4.04 | <3.3 | <3.4 | |
| Ru-106 | | <30.72 | <27.21 | <41.75 | |
| I-131 | (0.5*) | <0.19 | <0.20 | <0.19 | |
| Cs-134 | (7.5*) | <4.08 | <2.35 | <2.27 | |
| Cs-137 | (9.0*) | <4.2 | <2.5 | <3.65 | |
| Ba/La-140 | (7.5*) | <3.62 | <4.23 | <5.4 | |
| Ce-141 | | <6.25 | <4.08 | <5.83 | |
| Ce-144 | | <23.20 | <16.50 | <23.90 | |
| Ra-226 | | <90.05 | 112.8±48.97 | <76.57 | |
| Ac-228 | | <15.48 | <6.56 | <11.4 | |
| H-3 | | | | | |
| | | | | | |

Results reported as < are CL values

# TABLE B-11
# GROSS BETA ACTIVITY AND CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES - 2005

## INDIAN POINT SUMMARY SHEET

**SAMPLE TYPE: Drinking Water** **REPORTING UNITS IN: pCi/L ± 1 sigma** **Oct-05**

| ISOTOPE | MIN. REQ. CL* | CAMP FIELD RES. | NEW CROTON RES. | AMICUS RES. | 5TH STREET WELL |
|---|---|---|---|---|---|
| Gross Beta | LLD = 4.0 | 3.54 ± 0.48 | 2.18 ± 0.42 | 9.94 ± 0.66 | 8.78 ± 0.66 |
| Be-7 | | <22.36 | <22.01 | <31.19 | <37.63 |
| K-40 | | 196.7±45.27 | 189.7±32.09 | 115.8±32.55 | 128.9±36.69 |
| Mn-54 | (7.5*) | <3.53 | <2.67 | <3.72 | <3.27 |
| Co-58 | (7.5*) | <4.17 | <2.6 | <4.11 | <3.53 |
| Fe-59 | (15*) | <9.17 | <6.96 | <8.9 | <8.03 |
| Co-60 | (7.5*) | <4.24 | <2.86 | <3.62 | <3.45 |
| Zn-65 | (15*) | <8.06 | <5.67 | <5.71 | <5.51 |
| Zr-95 | (7.5*) | <3.88 | <4.18 | <5.6 | <6.6 |
| Nb-95 | (7.5*) | <4.07 | <2.66 | <2.54 | <2.37 |
| Ru-103 | | <3.55 | <3.17 | <3.68 | <3.6 |
| Ru-106 | | <34.65 | <28.39 | <31.84 | <37.4 |
| I-131 | (0.5*) | <0.31 | <0.29 | <0.29 | <0.31 |
| Cs-134 | (7.5*) | <4.33 | <3.2 | <2.37 | <2.97 |
| Cs-137 | (9.0*) | <3.24 | <2.37 | <3.78 | <4.4 |
| Ba/La-140 | (7.5*) | <4.02 | <2.76 | <3.75 | <4.07 |
| Ce-141 | | <5.76 | <4.57 | <7.31 | <6.44 |
| Ce-144 | | <18.90 | <16.50 | <30.80 | <26.00 |
| Ra-226 | | <76.38 | <54.17 | <102.5 | <89.44 |
| Ac-228 | | <12.95 | <9.96 | <12.41 | <11.94 |
| H-3 | | NA | NA | NA | <431 |
| | | | | | |

**Results reported as < are CL values**

# TABLE B-11
# GROSS BETA ACTIVITY AND CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES - 2005

**INDIAN POINT SUMMARY SHEET**

**SAMPLE TYPE: Drinking Water** **REPORTING UNITS IN: pCi/L ± 1 sigma** **MONTH / YEAR: NOV 2005**

| ISOTOPE | MIN. REQ. CL* | CAMP FIELD RES. | NEW CROTON RES. | AMICUS RES. | 5TH STREET WELL |
|---|---|---|---|---|---|
| Gross Beta | LLD = 4.0 | 2.37 ± 0.45 | 2.36 ± 0.44 | 2.97 ± 0.46 | 9.81 ± 0.66 |
| Be-7 | | <26.18 | <19.87 | <19.69 | <22.3 |
| K-40 | | 182.6±34.16 | 146.4±30.21 | 128.6±26.46 | 93±25.12 |
| Mn-54 | (7.5*) | <3.22 | <2.19 | <2.58 | <2.8 |
| Co-58 | (7.5*) | <2.83 | <2.28 | <2.31 | <2.66 |
| Fe-59 | (15*) | <6.39 | <7.79 | <5.89 | <5.36 |
| Co-60 | (7.5*) | <2.93 | <3.04 | <3.35 | <3.19 |
| Zn-65 | (15*) | <8.1 | <4.92 | <5.74 | <3.24 |
| Zr-95 | (7.5*) | <3.43 | <4.76 | <3.69 | <4.53 |
| Nb-95 | (7.5*) | <2.5 | <2.42 | <2.18 | <1.73 |
| Ru-103 | | <3.63 | <3.31 | <3.02 | <2.83 |
| Ru-106 | | <29.36 | <29.65 | <28.14 | <27.03 |
| I-131 | (0.5*) | <0.25 | <0.22 | <0.24 | <0.23 |
| Cs-134 | (7.5*) | <2.34 | <2.42 | <2.37 | <1.73 |
| Cs-137 | (9.0*) | <2.96 | <2.91 | <3.04 | <3.01 |
| Ba/La-140 | (7.5*) | <3.92 | <3.08 | <3.12 | <4.08 |
| Ce-141 | | <5.3 | <4.47 | <3.43 | <5.64 |
| Ce-144 | | <21.5 | <18.3 | <15.8 | <23.2 |
| Ra-226 | | <58.73 | <63.96 | 147±45.26 | <65.43 |
| Ac-228 | | <10.89 | <9.14 | <9.02 | <9.82 |
| H-3 | | NA | NA | NA | <476 |
| | | | | | |

**Results reported as < are CL values**

# TABLE B-11
# GROSS BETA ACTIVITY AND CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES - 2005

## INDIAN POINT SUMMARY SHEET

**SAMPLE TYPE: Drinking Water** **REPORTING UNITS IN: pCi/L ± 1 sigma** **Dec-05**

| ISOTOPE | MIN. REQ. CL* | CAMP FIELD RES. | NEW CROTON RES. | AMICUS RES. | 5TH STREET WELL |
|---|---|---|---|---|---|
| Gross Beta | LLD = 4.0 | 2.09 ± 0.51 | 3.25 ± 0.55 | 2.17 ± 0.52 | 8.29 ± 0.72 |
| Be-7 | | <21.23 | <21.47 | <18.35 | <26.04 |
| K-40 | | 153±30.32 | 130.9±27.35 | <22.59 | 128.6±29.43 |
| Mn-54 | (7.5*) | <3.23 | <2.09 | <1.59 | <2.87 |
| Co-58 | (7.5*) | <2.28 | <2.57 | <2.41 | <2.61 |
| Fe-59 | (15*) | <5.01 | <6.87 | <6.61 | <8.71 |
| Co-60 | (7.5*) | <3.86 | <2.96 | <2.99 | <2.53 |
| Zn-65 | (15*) | <7.58 | <7.59 | <6.18 | <3.55 |
| Zr-95 | (7.5*) | <3.75 | <4.69 | <3.85 | <5.18 |
| Nb-95 | (7.5*) | <3.07 | <2.84 | <2.8 | <2.57 |
| Ru-103 | | <3.01 | <2.64 | <2.95 | <2.94 |
| Ru-106 | | <24.84 | <31.19 | <27.68 | <30.23 |
| I-131 | (0.5*) | <0.20 | <0.21 | <0.26 | <0.19 |
| Cs-134 | (7.5*) | <2.16 | <4.3 | <2.66 | <2.76 |
| Cs-137 | (9.0*) | <2.67 | <2.76 | <3.01 | <3.23 |
| Ba/La-140 | (7.5*) | <3.07 | <3.94 | <4.09 | <2.99 |
| Ce-141 | | <4.54 | <4.38 | <4.22 | <5.51 |
| Ce-144 | | <19.60 | <19.00 | <16.90 | <22.40 |
| Ra-226 | | 90.8±44.14 | <58.05 | <58.91 | <68.39 |
| Ac-228 | | <9.81 | <8.41 | <8.98 | <9.03 |
| H-3 | | NA | NA | NA | NA |
| | | | | | |

**Results reported as < are CL values**

## TABLE B-12

## CONCENTRATION OF TRITIUM IN DRINKING WATER SAMPLES*- 2005 (QUARTERLY COMPOSITES)

(pCi/L ± 1 sigma)

**CAMP FIELD RESERVOIR**

| Radionuclide | 1ST Quarter | 2ND Quarter | 3RD Quarter | 4TH Quarter |
|---|---|---|---|---|
| TRITIUM | <421 | <409 | <406 | <464 |

**NEW CROTON RESERVOIR**

| Radionuclide | 1ST Quarter | 2ND Quarter | 3RD Quarter | 4TH Quarter |
|---|---|---|---|---|
| TRITIUM | <421 | <409 | <406 | <464 |

**5th STREET WELL**

| Radionuclide | 1ST Quarter | 2ND Quarter | 3RD Quarter | 4TH Quarter |
|---|---|---|---|---|
| TRITIUM | <421 | <409 | <409 | <464 |

* "Less than" values expressed as Critical Level ($L_c$).

## TABLE B-13

### SHORELINE SOIL SAMPLES**-2005

(pCi/Kg ,dry ± 1 sigma)

**Jun-05**

| ISOTOPE | MIN. REQ. CL* | OFF VERPLANK IP-05-295 | LENTS COVE IP-05-297 | MANITOU INLET IP-05-298 | WHITE BEACH IP-05-296 | COLD SPRING IP-05-299 |
|---|---|---|---|---|---|---|
| Be-7 | | <196.7 | 2613 ± 508.3 | <315.5 | <204.1 | <204.1 |
| K-40 | | 16110 ± 781.7 | 8313 ± 860.1 | 14800 ± 863.7 | 10410 ± 608.1 | 10410 ± 608.1 |
| Mn-54 | | <29.41 | <46.07 | <30.8 | <18.73 | <18.73 |
| Co-58 | | <28.12 | <57.66 | <35.45 | <25.84 | <25.84 |
| Fe-59 | | <107.3 | <134.8 | <76.79 | <87.91 | <87.91 |
| Co-60 | | <35.01 | <62.66 | <25.85 | <24.54 | <24.54 |
| Zn-65 | | <72.12 | <103.6 | <49.07 | <69.98 | <69.98 |
| Zr-95 | | <59.27 | <105.7 | <57.08 | <40.03 | <40.03 |
| Nb-95 | | <29.9 | <57.7 | <34.29 | <24.74 | <24.74 |
| Ru-103 | | <25.64 | <70.71 | <32.41 | <21.8 | <21.8 |
| Ru-106 | | <204.5 | <680 | <281 | <226.8 | <226.8 |
| I-131 | | <62.22 | <152.3 | <74.22 | <42.37 | <42.37 |
| Cs-134 | (75*) | <30.85 | <67.54 | <30.27 | <13.66 | <13.66 |
| Cs-137 | (90*) | 149.5 ± 23.1 ** | <59.53 | 173.5 ± 26.1 ** | <20.58 | <20.58 |
| BaLa-140 | | <53 | <158.4 | <66.2 | <50.93 | <50.93 |
| Ce-141 | | <39.12 | <98.11 | <58.07 | <35.84 | <35.84 |
| Ce-144 | | <143.00 | <306.00 | <176.00 | <124.00 | <164.00 |
| Ra-226 | | 1166 ± 394.6 | 4374 ± 865.3 | 2398 ± 629.8 | 638.4 ± 348.6 | 638.4 ± 348.6 |
| AcTh-228 | | 513.6 ± 94.51 | 994.2 ± 232.3 | 679.6 ± 128.3 | <71.64 | <71.64 |
| | | | | | | |

**September-05**

| ISOTOPE | MIN. REQ. CL* | OFF VERPLANK IP-05-569 | LENTS COVE IP-05-572 | MANITOU INLET IP-05-568 | WHITE BEACH IP-05-571 | COLD SPRING IP-05-570 |
|---|---|---|---|---|---|---|
| Be-7 | | <191.1 | <384.5 | 727.7 ± 478.7 | <122.2 | <194.00 |
| K-40 | | 16000 ± 725.3 | 12370 ± 1183 | 13140 ± 1248 | 9015 ± 446.7 | 38700 ± 936 |
| Mn-54 | | <25.26 | <30.19 | <69.71 | <15.19 | <26.80 |
| Co-58 | | <24.05 | <39.63 | <75.04 | <16.65 | <28.30 |
| Fe-59 | | <77.7 | <199.1 | <197.2 | <53.73 | <94.30 |
| Co-60 | | <23.76 | <60.29 | <68.06 | <13.85 | <64.60 |
| Zn-65 | | <34.53 | <170.2 | <216.6 | <44.81 | <47.80 |
| Zr-95 | | <38.48 | <103.3 | <150.2 | <26.39 | <49.30 |
| Nb-95 | | <31.58 | <49.88 | <89.46 | <18.31 | <31.30 |
| Ru-103 | | <21.71 | <52.65 | <95.7 | <15.5 | <25.00 |
| Ru-106 | | <157 | <428.5 | <692.4 | <187.2 | <274.00 |
| I-131 | | <37.99 | <103.9 | <195.6 | <26.3 | <43.00 |
| Cs-134 | (75*) | <22.87 | <50.4 | <54.55 | <19.67 | <27.60 |
| Cs-137 | (90*) | 143.8 ± 24.69 | <34.96 | <77.33 | <13.85 | **36.3 ± 17.4** |
| BaLa-140 | | <39.45 | <106.7 | <219.4 | <20.62 | <59.80 |
| Ce-141 | | <32.99 | <62.03 | <125.7 | <27.64 | <39.00 |
| Ce-144 | | <127.00 | <183.00 | <407.00 | <90.50 | <145.00 |
| Ra-226 | | 640.1 ± 348.4 | <716.7 | 5381 ± 1199 | 797.4 ± 261 | 1180 ± 386 |
| AcTh-228 | | 614 ± 80.01 | 730.8 ± 171.6 | 1569 ± 274.6 | <52.15 | 427 ± 87.1 |
| | | | | | | |

**Results reported as < are CL values**
***Posted CL's correspond to LLD's listed in TS-5.104 (Rev.5)**
**** Cs-137 Value represent average of two counts.**

* Indicates naturally occurring.
** "Less than" values expressed as Critical Level ($L_c$).
*** Indicates the average of the positive sample results reported for samples with recounts performed.

# TABLE B-14

## CONCENTRATIONS OF GAMMA EMITTERS IN BROAD LEAF VEGETATION*** - 2005

(pCi/Kg, wet ± 1 sigma)

**#23 Roseton****

**May**

| Radionuclide | BURDOCK | Common Mullein | RAGWEED |
|---|---|---|---|
| Be-7* | 584.9±143.9 | 438.3±131.2 | 534 ± 133 |
| K-40* | 7117±480.5 | 4705±460.6 | 8619±563.9 |
| Mn-54 | <17.45 | <16.23 | <16.32 |
| Co-58 | <12.37 | <21.04 | <17.12 |
| Fe-59 | <60.09 | <50.63 | <52.51 |
| Co-60 | <23.46 | <16.61 | <8.41 |
| Zn-65 | <46.87 | <43.12 | <51.78 |
| Zr-95 | <29.65 | <22.65 | <32.99 |
| Nb-95 | <18.24 | <22.55 | <22.15 |
| Ru-103 | <13.82 | <17.18 | <14.53 |
| Ru-106 | <109.1 | <204.1 | <203.1 |
| I-131 | <15.8 | <23.71 | <18.59 |
| Cs-134 | <23.09 | <21.55 | <22.98 |
| Cs-137 | <19.61 | <17.43 | <15.89 |
| Ba/La-140 | <28.85 | <25.6 | <19.41 |
| Ce-141 | <21.45 | <22.1 | <23.29 |
| Ce-144 | <78.8 | <98.7 | <90.6 |
| Ra-226* | <282.9 | <312.8 | <300 |
| Ac/Th-228* | <68.75 | <53.12 | <77.03 |

**June**

| Radionuclide | RAGWEED | BURDOCK | MULLEIN |
|---|---|---|---|
| Be-7* | 266.3±113.5 | 804.1±90.44 | 533.2±110.6 |
| K-40* | 8400±555.5 | 7868±359.2 | 6453±439.1 |
| Mn-54 | <15.34 | <11.04 | <17.85 |
| Co-58 | <13.32 | <11.43 | <13.89 |
| Fe-59 | <67.1 | <36.54 | <42.59 |
| Co-60 | <18.39 | <13.26 | <6.82 |
| Zn-65 | <40.62 | <29.8 | <40.58 |
| Zr-95 | <34.46 | <18.27 | <24.21 |
| Nb-95 | <20.52 | <9.4 | <17.97 |
| Ru-103 | <18.55 | <9.52 | <16.66 |
| Ru-106 | <172.8 | <88.05 | <185.5 |
| I-131 | <13.59 | <11.98 | <15.85 |
| Cs-134 | <21.23 | <11.41 | <19.77 |
| Cs-137 | <19.44 | <10.27 | <20.15 |
| Ba/La-140 | <19.34 | <5.33 | <12.86 |
| Ce-141 | <20.43 | <12.64 | <20.34 |
| Ce-144 | <77.9 | <53.7 | <75.4 |
| Ra-226* | <308.5 | <178.1 | <314.2 |
| Ac/Th-228* | <89.37 | <35 | <72.8 |

**July**

| Radionuclide | RAGWEED | MULLEN | CATALPA |
|---|---|---|---|
| Be-7* | 1189±157.8 | 747.2±89.32 | 506.1±81.53 |
| K-40* | 7234±521.2 | 4945±292.6 | 3744±249.6 |
| Mn-54 | <12.17 | <9.23 | <9.61 |
| Co-58 | <12.2 | <11.18 | <8.44 |
| Fe-59 | <19.45 | <28.56 | <21.03 |
| Co-60 | <18.44 | <8.06 | <6.89 |
| Zn-65 | <42.74 | <26.4 | <26.1 |
| Zr-95 | <33.34 | <15.78 | <14.9 |
| Nb-95 | <18.44 | <10.6 | <11.5 |
| Ru-103 | <16.79 | <8.26 | <8.43 |
| Ru-106 | <173.4 | <76 | <86.02 |
| I-131 | <18.97 | <10.53 | <11.13 |
| Cs-134 | <20.2 | <11.77 | <9.81 |
| Cs-137 | <16.17 | <9.54 | <8.32 |
| Ba/La-140 | <11.25 | <10.79 | <7.53 |
| Ce-141 | <21.24 | <11.39 | <11.29 |
| Ce-144 | <77.3 | <53.7 | <46.7 |
| Ra-226* | <329.9 | <177.9 | 350.1±148.6 |
| Ac/Th-228* | <65.47 | <34.08 | <35.14 |

**Aug**

| Radionuclide | RAGWEED | BURDOCK | CALTALPA |
|---|---|---|---|
| Be-7* | 937.6±61.61 | 679.8±53.06 | 605.6±37.89 |
| K-40* | 6857±204.1 | 5816±200.2 | 3182±112.1 |
| Mn-54 | <6.59 | <6.1 | <4.49 |
| Co-58 | <6.2 | <6.5 | <4.06 |
| Fe-59 | <22.29 | <20.44 | <13.01 |
| Co-60 | <6.81 | <7.04 | <4.93 |
| Zn-65 | <17.78 | <21.05 | <10.29 |
| Zr-95 | <12.81 | <9.9 | <7.52 |
| Nb-95 | <6.85 | <6.32 | <4.7 |
| Ru-103 | <7.17 | <5.32 | <3.8 |
| Ru-106 | <69.73 | <44.17 | <40.46 |
| I-131 | <8.16 | <7.16 | <5.29 |
| Cs-134 | <8.46 | <4.88 | <5.36 |
| Cs-137 | <6.38 | <5.37 | <3.58 |
| Ba/La-140 | <8.55 | <8.18 | <4.86 |
| Ce-141 | <8.18 | <5.83 | <3.72 |
| Ce-144 | <33.4 | <26.1 | <19.1 |
| Ra-226* | 333.5±100.7 | 322.7±75.45 | 349.7±65.13 |
| Ac/Th-228* | 62±22.8 | <26.86 | <16.36 |

* Indicates naturally occurring.

** Indicates control location.

*** "Less than" values expressed as Critical Level ($L_c$).

# TABLE B-14

## CONCENTRATIONS OF GAMMA EMITTERS IN BROAD LEAF VEGETATION*** - 2005

*(pCi/Kg, wet ± 1 sigma)*

**#23 Roseton (continued)****

**September**

| Radionuclide | RAGWEED | MULLEN | GOLDEN ROD |
|---|---|---|---|
| Be-7* | 979.4±125.6 | 283.4±71.37 | 789.7±147.9 |
| K-40* | 8960±447.9 | 7392±329.2 | 9684±595.8 |
| Mn-54 | <17.81 | <10.95 | <19.53 |
| Co-58 | <15.93 | <11.82 | <20.39 |
| Fe-59 | <51.09 | <28.78 | <46.19 |
| Co-60 | <15.44 | <12.02 | <20.9 |
| Zn-65 | <37.14 | <27.66 | <44.59 |
| Zr-95 | <22.17 | <22.32 | <32.2 |
| Nb-95 | <18.54 | <11.77 | <16.38 |
| Ru-103 | <14.66 | <10.55 | <14.3 |
| Ru-106 | <126.4 | <114.7 | <201 |
| I-131 | <18.41 | <13.07 | <23.24 |
| Cs-134 | <15.75 | <9.9 | <15.13 |
| Cs-137 | <15.14 | <8.74 | <18.08 |
| Ba/La-140 | <20.93 | <16.13 | <31.81 |
| Ce-141 | <15.2 | <12.36 | <23.62 |
| Ce-144 | <62.40 | <50.80 | <84.70 |
| Ra-226* | 388.8±176.8 | 296±147.2 | <343.1 |
| Ac/Th-228* | <57.18 | <44.99 | <85.91 |

**October**

| Radionuclide | GOLDEN ROD | RAGWEED | MULLEN |
|---|---|---|---|
| Be-7* | 1277±132.7 | 1504±171.1 | 391.3±94.11 |
| K-40* | 8046±441.1 | 7100±527.3 | 6441±389.9 |
| Mn-54 | <13.94 | <14.25 | <12.18 |
| Co-58 | <11.99 | <18.08 | <12.65 |
| Fe-59 | <42.22 | <41.61 | <34.59 |
| Co-60 | <13.98 | <26.81 | <11.95 |
| Zn-65 | <43.44 | <51.66 | <43.72 |
| Zr-95 | <22.05 | <32.87 | <24.22 |
| Nb-95 | <12.77 | <18.04 | <11.96 |
| Ru-103 | <13.91 | <12.09 | <10.3 |
| Ru-106 | <146.3 | <163.1 | <133.7 |
| I-131 | <16.67 | <21.25 | <15.64 |
| Cs-134 | <16.94 | <21.84 | <9.85 |
| Cs-137 | <15.2 | <16.53 | <15.2 |
| Ba/La-140 | <15.2 | <20.83 | <15.02 |
| Ce-141 | <20.62 | <21.36 | <15.55 |
| Ce-144 | <79.6 | <91.3 | <62.1 |
| Ra-226* | <274.7 | <339 | <240.4 |
| Ac/Th-228* | <50.19 | <70.11 | <52.77 |

* Indicates naturally occurring.

** Indicates control location.

*** "Less than" values expressed as Critical Level ($L_c$).

# TABLE B-14

## CONCENTRATIONS OF GAMMA EMITTERS IN BROAD LEAF VEGETATION*** - 2005

(pCi/Kg, wet ± 1 sigma)

### #94 IPEC Training Center

**May**

| Radionuclide | JAPANESE KNOTWEED | POKEWEED | RAGWEED |
|---|---|---|---|
| Be-7* | <67.19 | 886.8±113.6 | 526 ± 88.5 |
| K-40* | 5733±258.8 | 5583±348.1 | 9054±421.8 |
| Mn-54 | <10.1 | <10.68 | <11.64 |
| Co-58 | <10.81 | <14.19 | <11.93 |
| Fe-59 | <28.63 | <37.97 | <45.06 |
| Co-60 | <9.91 | <13.66 | <14.09 |
| Zn-65 | <22.74 | <40.09 | <29.81 |
| Zr-95 | <16.92 | <17.06 | <22.01 |
| Nb-95 | <10.85 | <14.99 | <12.15 |
| Ru-103 | <9.55 | <8.74 | <10.81 |
| Ru-106 | <103.9 | <97.24 | <130.9 |
| I-131 | <11.53 | <13.74 | <13.35 |
| Cs-134 | <7.26 | <13.64 | <17.28 |
| Cs-137 | <8.55 | <9.84 | <13.24 |
| Ba/La-140 | <11.05 | <11.33 | <11.89 |
| Ce-141 | <12.57 | <13.85 | <14.26 |
| Ce-144 | <59 | <66 | <70 |
| Ra-226* | 276.9±138.2 | <192 | <252 |
| Ac/Th-228* | <41.02 | <40.4 | <50.11 |

**June**

| Radionuclide | BURDOCK | GRAPE LEAVES | RAGWEED |
|---|---|---|---|
| Be-7* | 805.1±103.1 | <134 | 432.2±79.64 |
| K-40* | 6567±368.5 | 5389±373.4 | 9602±350 |
| Mn-54 | <12.73 | <12.39 | <13.07 |
| Co-58 | <8.31 | <15.12 | <10.29 |
| Fe-59 | <30.21 | <34.69 | <32.42 |
| Co-60 | <12.11 | <12.92 | <13.91 |
| Zn-65 | <37.4 | <48.3 | <34.14 |
| Zr-95 | <19.99 | <24.42 | <18.69 |
| Nb-95 | <14.34 | <11.95 | <10.23 |
| Ru-103 | <11.62 | <14.11 | <10.55 |
| Ru-106 | <128.9 | <136.3 | <122 |
| I-131 | <11.3 | <14.44 | <13.08 |
| Cs-134 | <14.79 | <17.26 | <7.83 |
| Cs-137 | <9.85 | <11.82 | <13.61 |
| Ba/La-140 | <17.41 | <13.96 | <11.42 |
| Ce-141 | <12.47 | <17.05 | <16.76 |
| Ce-144 | <48.2 | <65 | <68.9 |
| Ra-226* | 545.3±169.7 | 482.1±226.2 | <222.7 |
| Ac/Th-228* | <43.44 | <53.66 | <44.56 |

**July**

| Radionuclide | RAGWEED | GRAPE LEAVES | MULLEN |
|---|---|---|---|
| Be-7* | 280.3±124.5 | 278.9±75.85 | 534±109.1 |
| K-40* | 7706±570.8 | 3279±239.2 | 4600±334.6 |
| Mn-54 | <14.6 | <8.57 | <15.41 |
| Co-58 | <18.33 | <9.45 | <12.71 |
| Fe-59 | <70.15 | <25.38 | <50.04 |
| Co-60 | <24.68 | <10.16 | <14.75 |
| Zn-65 | <70.91 | <12.03 | <28.65 |
| Zr-95 | <28.9 | <19.99 | <24.15 |
| Nb-95 | <10.8 | <13.54 | <15.8 |
| Ru-103 | <16.21 | <9.98 | <13.96 |
| Ru-106 | <137.1 | <91.42 | <125.5 |
| I-131 | <16.6 | <10.49 | <9.43 |
| Cs-134 | <14.14 | <10.03 | <15.73 |
| Cs-137 | <15.86 | <9.84 | <14.52 |
| Ba/La-140 | <30.79 | <13.58 | <17.87 |
| Ce-141 | <18.61 | <11.12 | <16.87 |
| Ce-144 | <61 | <40.9 | <72.8 |
| Ra-226* | <308.8 | 300.3±121.3 | <260.6 |
| Ac/Th-228* | <66.13 | <36.46 | <56.48 |

**Aug**

| Radionuclide | RAGWEED | GRAPE LEAVES | BURDOCK |
|---|---|---|---|
| Be-7* | 1087±75.54 | 1344±61.27 | 1320±74.02 |
| K-40* | 8356±245 | 3154±122.9 | 8202±250.8 |
| Mn-54 | <6.42 | <4.45 | <7.19 |
| Co-58 | <10.01 | <4.96 | <8.7 |
| Fe-59 | <26.43 | <14.82 | <28.82 |
| Co-60 | <9.96 | <5.22 | <8.92 |
| Zn-65 | <23.25 | <12.13 | <24.85 |
| Zr-95 | <15.25 | <8.92 | <13.01 |
| Nb-95 | <8.76 | <6.04 | <8.98 |
| Ru-103 | <8.48 | <5.13 | <6.23 |
| Ru-106 | <76.46 | <50.87 | <71.89 |
| I-131 | <11.27 | <8.97 | <10.76 |
| Cs-134 | <9.57 | <6.78 | <5.79 |
| Cs-137 | <7.79 | <4.9 | <6.25 |
| Ba/La-140 | <10.9 | <7.2 | <11.4 |
| Ce-141 | <11.44 | <7.35 | <7.37 |
| Ce-144 | <41.3 | <26.9 | <29.4 |
| Ra-226* | <146 | 179±73.65 | 292.4±82.38 |
| Ac/Th-228* | <28.03 | <19.9 | <32.56 |

* Indicates naturally occurring.
** Indicates control location.
*** "Less than" values expressed as Critical Level ($L_c$).

# TABLE B-14

## CONCENTRATIONS OF GAMMA EMITTERS IN BROAD LEAF VEGETATION*** - 2005

(pCi/Kg, wet ± 1 sigma)

**#94 IPEC Training Center (continued)**

**September**

| Radionuclide | GOLDEN ROD | RAGWEED | POKEWEED |
|---|---|---|---|
| Be-7* | 1147±134 | 1463±152 | 247.8±64.54 |
| K-40* | 6686±407.4 | 5813±392.8 | 4734±280.7 |
| Mn-54 | <12.49 | <14.01 | <8.55 |
| Co-58 | <17.08 | <15.71 | <10.1 |
| Fe-59 | <38.03 | <36.5 | <19.42 |
| Co-60 | <18.05 | <16.57 | <12.49 |
| Zn-65 | <39.55 | <52.64 | <33.64 |
| Zr-95 | <21.32 | <29.29 | <11.27 |
| Nb-95 | <15 | <20.98 | <7.35 |
| Ru-103 | <12.38 | <15.36 | <8.15 |
| Ru-106 | <163.1 | <156.2 | <77.67 |
| I-131 | <15.14 | <18.56 | <9.04 |
| Cs-134 | <16.55 | <20.64 | <6.47 |
| Cs-137 | <16.48 | <16.14 | <7.91 |
| Ba/La-140 | <16.89 | <23.27 | <13.65 |
| Ce-141 | <19.16 | <19.72 | <9.23 |
| Ce-144 | <85.20 | <82.50 | <33.40 |
| Ra-226* | <330.2 | <317.7 | <134.6 |
| Ac/Th-228* | <44.19 | <45.87 | <36.16 |

**October**

| Radionuclide | RAGWEED | GRAPE LEAVES | POKEWEED |
|---|---|---|---|
| Be-7* | 1489±172.5 | 969.6±127.3 | <106.3 |
| K-40* | 7786±487.5 | 3873±344.3 | 6275±494.3 |
| Mn-54 | <17.59 | <13 | <13.17 |
| Co-58 | <17.41 | <14.06 | <16.28 |
| Fe-59 | <65.24 | <41.45 | <50.84 |
| Co-60 | <21.84 | <16.19 | <14.58 |
| Zn-65 | <62.51 | <38.57 | <60.2 |
| Zr-95 | <37.68 | <18.04 | <35.24 |
| Nb-95 | <22.09 | <11.4 | <15.64 |
| Ru-103 | <17.96 | <13.59 | <13.9 |
| Ru-106 | <155.4 | <151 | <140.4 |
| I-131 | <18.55 | <10.29 | <12.82 |
| Cs-134 | <23.09 | <19.3 | <11.44 |
| Cs-137 | <16.56 | <14.18 | <16.53 |
| Ba/La-140 | <21.08 | <13.67 | <23.59 |
| Ce-141 | <25.14 | <15.47 | <17.57 |
| Ce-144 | <88.1 | <85 | <67 |
| Ra-226* | <314.7 | <276.8 | <244.9 |
| Ac/Th-228* | <79.94 | <47.88 | <55.84 |

* Indicates naturally occurring.
** Indicates control location.
*** "Less than" values expressed as Critical Level ($L_c$).

# TABLE B-14

## CONCENTRATIONS OF GAMMA EMITTERS IN BROAD LEAF VEGETATION*** - 2005

(pCi/Kg, wet ± 1 sigma)

### #95 Meteorological Tower

**May**

| Radionuclide | CROWN VETCH | RAGWEED | BITTER SWEET |
|---|---|---|---|
| Be-7* | <111.4 | 318.5±74.71 | 344 ± 178 |
| K-40* | 4064±438.6 | 6831±335.1 | 5556±317.1 |
| Mn-54 | <13.99 | <10.29 | <10.52 |
| Co-58 | <9.48 | <9.78 | <11.13 |
| Fe-59 | <46.86 | <30.83 | <32.54 |
| Co-60 | <19.31 | <10.27 | <11.64 |
| Zn-65 | <45.76 | <26.45 | <36.24 |
| Zr-95 | <25.28 | <14.59 | <21.02 |
| Nb-95 | <17.07 | <10.52 | <9.4 |
| Ru-103 | <11.86 | <7.99 | <8.88 |
| Ru-106 | <193.4 | <77.87 | <100.3 |
| I-131 | <14.52 | <10.16 | <9.88 |
| Cs-134 | <12.25 | <11.03 | <7.85 |
| Cs-137 | <12.23 | <9.37 | <11.72 |
| Ba/La-140 | <20.15 | <9.12 | <16.78 |
| Ce-141 | <13.75 | <9.5 | <14.36 |
| Ce-144 | <64.2 | <45 | <61.7 |
| Ra-226* | <236 | <174.6 | 344.1±178.3 |
| Ac/Th-228* | <41.91 | <37.3 | <43.25 |

**June**

| Radionuclide | RAGWEED | BITTER SWEET | GRAPE LEAVES |
|---|---|---|---|
| Be-7* | 354.3±116.1 | 277.4±84.05 | 242.4±90.25 |
| K-40* | 7670±525.4 | 4424±325.9 | 4013±308.3 |
| Mn-54 | <18.72 | <9.15 | <13.69 |
| Co-58 | <17.14 | <12.9 | <13.27 |
| Fe-59 | <66.03 | <30.87 | <34 |
| Co-60 | <23.66 | <16.25 | <13.53 |
| Zn-65 | <42.58 | <33.26 | <32.79 |
| Zr-95 | <31.54 | <17.9 | <25.88 |
| Nb-95 | <14.97 | <16.54 | <12.78 |
| Ru-103 | <15.78 | <9.17 | <11.81 |
| Ru-106 | <145.2 | <115.1 | <124 |
| I-131 | <15.37 | <14.15 | <15.71 |
| Cs-134 | <20.35 | <13.49 | <15.55 |
| Cs-137 | <13.19 | <10.32 | <12.55 |
| Ba/La-140 | <17.63 | <15.35 | <12.12 |
| Ce-141 | <19.87 | <15.7 | <15.66 |
| Ce-144 | <82.1 | <71.5 | <64.6 |
| Ra-226* | <278.7 | <230.4 | 338.4±178.1 |
| Ac/Th-228* | <49.46 | <50.46 | <40.55 |

**July**

| Radionuclide | RAGWEED | BITTER SWEET | GRAPE LEAVES |
|---|---|---|---|
| Be-7* | 344.1±115.5 | <100.2 | <167.3 |
| K-40* | 7572±501.9 | 4734±350.5 | 5074±495.9 |
| Mn-54 | <19.21 | <13.25 | <18.35 |
| Co-58 | <17.13 | <15.63 | <15.43 |
| Fe-59 | <66.22 | <44.68 | <48.9 |
| Co-60 | <19.46 | <10.53 | <25.81 |
| Zn-65 | <48.1 | <28.91 | <36.71 |
| Zr-95 | <24.35 | <20.08 | <23.36 |
| Nb-95 | <12.98 | <16.68 | <25.8 |
| Ru-103 | <16.12 | <14.23 | <18.47 |
| Ru-106 | <194.3 | <142.3 | <193.9 |
| I-131 | <18.43 | <14.83 | <18.67 |
| Cs-134 | <13.5 | <15.6 | <21.92 |
| Cs-137 | <13.9 | <12.6 | <17.62 |
| Ba/La-140 | <13.14 | <20.32 | <23.49 |
| Ce-141 | <20.62 | <14.5 | <23.79 |
| Ce-144 | <87.9 | <68.4 | <79.6 |
| Ra-226* | <323.5 | <220.2 | <321.1 |
| Ac/Th-228* | <71.99 | <45.55 | <78.18 |

**Aug**

| Radionuclide | RAGWEED | COMMON MULLEIN | GRAPE LEAVES |
|---|---|---|---|
| Be-7* | 832.3±67.02 | 1306±83.37 | 282.6±43.47 |
| K-40* | 5613±198.6 | 9779±278.6 | 3397±146.5 |
| Mn-54 | <7.75 | <9.68 | <4.78 |
| Co-58 | <8.23 | <9.87 | <4.57 |
| Fe-59 | <23.86 | <29.38 | <19.05 |
| Co-60 | <8.3 | <11.49 | <4.8 |
| Zn-65 | <18.8 | <21.82 | <13.65 |
| Zr-95 | <13.62 | <17.67 | <8.27 |
| Nb-95 | <8.64 | <9.88 | <6.71 |
| Ru-103 | <6.28 | <8.41 | <5.57 |
| Ru-106 | <70.23 | <77.58 | <43.76 |
| I-131 | <11.13 | <12.85 | <8.46 |
| Cs-134 | <8.74 | <10.48 | <5.94 |
| Cs-137 | <6.74 | <8.54 | <4.63 |
| Ba/La-140 | <11.54 | <12.51 | <8.17 |
| Ce-141 | <10.13 | <9.78 | <7.54 |
| Ce-144 | <39.4 | <36.8 | <28.2 |
| Ra-226* | 263.5±102.8 | 779.5±117.2 | 215.8±70.61 |
| Ac/Th-228* | <24.46 | <36.34 | <21.7 |

* Indicates naturally occurring.
** Indicates control location.
*** "Less than" values expressed as Critical Level ($L_c$).

# TABLE B-14

## CONCENTRATIONS OF GAMMA EMITTERS IN BROAD LEAF VEGETATION*** - 2005

(pCi/Kg, wet ± 1 sigma)

**#95 Meteorological Tower (continued)**

**Sept**

| Radionuclide | GRAPE LEAVES | GOLDEN ROD | RAGWEED |
|---|---|---|---|
| Be-7* | 454.2±106.8 | 516.8±111.5 | 1244±146.2 |
| K-40* | 4451±380.6 | 6472±408.9 | 8363±480.9 |
| Mn-54 | <15.08 | <17.21 | <19.26 |
| Co-58 | <15.69 | <15.02 | <20.87 |
| Fe-59 | <48.17 | <37.31 | <43.13 |
| Co-60 | <13.81 | <19.15 | <11.58 |
| Zn-65 | <37.3 | <41.85 | <49.84 |
| Zr-95 | <27.64 | <27.43 | <28.43 |
| Nb-95 | <10.72 | <13.4 | <15.93 |
| Ru-103 | <13.29 | <16.23 | <15.72 |
| Ru-106 | <133.4 | <157.6 | <189.5 |
| I-131 | <11.52 | <21.59 | <18.6 |
| Cs-134 | <14.91 | <23.24 | <15.38 |
| Cs-137 | <14.73 | <15.95 | <17.92 |
| Ba/La-140 | <21.93 | <23.11 | <22.69 |
| Ce-141 | <18.36 | <19.23 | <21.82 |
| Ce-144 | <76.20 | <82.90 | <102.00 |
| Ra-226* | <287.2 | <288.5 | 529.1±286.8 |
| Ac/Th-228* | <58.12 | <62.7 | <83.35 |

**October**

| Radionuclide | RAGWEED | GRAPE LEAVES | BITTER SWEET |
|---|---|---|---|
| Be-7* | 1216±156.2 | 489.5±113.1 | 492.8±125.6 |
| K-40* | 9400±567.5 | 3810±351.1 | 3127±374.2 |
| Mn-54 | <17.13 | <16.64 | <25.35 |
| Co-58 | <18.31 | <14.26 | <23.43 |
| Fe-59 | <57.86 | <51.01 | <49.33 |
| Co-60 | <14.58 | <19.39 | <23.18 |
| Zn-65 | <39.99 | <27.05 | <27.22 |
| Zr-95 | <31.69 | <24.19 | <30.63 |
| Nb-95 | <16.82 | <18.94 | <24.49 |
| Ru-103 | <16.49 | <14.23 | <14.53 |
| Ru-106 | <195.1 | <153.5 | <177.8 |
| I-131 | <14.28 | <15.98 | <17.8 |
| Cs-134 | <7.8 | <24.67 | <25.77 |
| Cs-137 | <17.83 | <14.41 | <18.83 |
| Ba/La-140 | <17.28 | <11.17 | <21.51 |
| Ce-141 | <20.31 | <21.34 | <24.05 |
| Ce-144 | <87.7 | <99.8 | <111 |
| Ra-226* | 573.2±252.7 | <319 | <387.9 |
| Ac/Th-228* | <60.63 | <60.35 | <74.15 |

* Indicates naturally occurring.
** Indicates control location.
*** "Less than" values expressed as Critical Level ($L_c$).

# 2005 TABLE B-15
# CONCENTRATIONS OF GAMMA EMITTERS IN FISH AND INVERTEBRATE SAMPLES
(pCi/Kg, wet ± 1 sigma)

| #23 Roeston (control) | | | | |
|---|---|---|---|---|
| Radionuclide | CAT FISH | STRIPED BASS | WHITE PERCH | |
| Be-7 | <212.8 | <249.6 | <240.1 | |
| K-40 | 4825±550.4 | 5672±417.3 | 4448±449.3 | |
| Mn-54 | <24.22 | <21.5 | <20.59 | |
| Co-58 | <10.06 | <29.67 | <25.57 | |
| Fe-59 | <76.39 | <103 | <77.5 | |
| Co-60 | <19.1 | <22.82 | <23.1 | |
| Zn-65 | <72.21 | <48.55 | <31.15 | |
| Zr-95 | <57.26 | <50.92 | <41.82 | |
| Nb-95 | <33.18 | <37.28 | <25.24 | |
| Ru-103 | <26.81 | <33.72 | <26.39 | |
| Ru-106 | <268.2 | <181.8 | <174.9 | |
| I-131 | <90.23 | <423.6 | <74.65 | |
| Cs-134 | <27.97 | <20.58 | <22.62 | |
| Cs-137 | <27.77 | <16.72 | <19.58 | |
| Ba/La-140 | <60.64 | <189.6 | <37.21 | |
| Ce-141 | <45.13 | <46.57 | <35.58 | |
| Ce-144 | <120 | <116 | <133 | |
| Ra-226 | <428.2 | <340.1 | <455.7 | |
| Ac-228 | <93.91 | <71.44 | <72.36 | |
| DATE | 15-Jun-05 | 24-May-05 | 15-Jun-05 | |

| Radionuclide | CAT FISH | WHITE PERCH | AMER. EEL | BLUE CRAB |
|---|---|---|---|---|
| Be-7 | <281 | <173.2 | <206.8 | <202.4 |
| K-40 | 4724±470.8 | 3666±298.6 | 3428±303 | 3025±411.4 |
| Mn-54 | <22.17 | <16.45 | <14.55 | <19.86 |
| Co-58 | <27.61 | <16.06 | <23.58 | <29.04 |
| Fe-59 | <92.64 | <46.01 | <67.94 | <64.14 |
| Co-60 | <23.15 | <15.41 | <13.4 | <24.23 |
| Zn-65 | <62.46 | <34.63 | <36.04 | <67.2 |
| Zr-95 | <53.18 | <26.79 | <32.46 | <65.63 |
| Nb-95 | <36.21 | <21.94 | <33.25 | <49.88 |
| Ru-103 | <40.57 | <22.16 | <28.06 | <38.45 |
| Ru-106 | <219.3 | <146.9 | <190.3 | <210.6 |
| I-131 | <479.5 | <155.5 | <379.5 | <427.4 |
| Cs-134 | <19.33 | <13.02 | <14.09 | <19.49 |
| Cs-137 | <16.72 | <18.18 | <14.56 | <13.66 |
| Ba/La-140 | <167.9 | <55.31 | <127.9 | <201.5 |
| Ce-141 | <55.89 | <33.85 | <38.8 | <36.99 |
| Ce-144 | <117 | <79.6 | <84.5 | <82.2 |
| Ra-226 | 645.5±321 | <248.9 | 466.8±194.1 | 786.1±264.1 |
| Ac-228 | <101.9 | <37.92 | <68.96 | <50.88 |
| DATE | 2-Aug-05 | 12-Aug-05 | 2-Aug-05 | 2-Aug-05 |

* Indicates naturally occurring.

# 2005 TABLE B-15
# CONCENTRATIONS OF GAMMA EMITTERS IN FISH AND INVERTEBRATE SAMPLES
(pCi/Kg, wet ± 1 sigma)

| #25 Downstream (Hudson River) (indicator) | | | | |
|---|---|---|---|---|
| Radionuclide | CAT FISH | AMER. EEL | WHITE PERCH | |
| Be-7 | <204.1 | <170.4 | <147.4 | |
| K-40 | 3851±520.1 | 5303±473.8 | 3624±370.9 | |
| Mn-54 | <22.52 | <28.01 | <22.6 | |
| Co-58 | <21.95 | <28.89 | <19.32 | |
| Fe-59 | <101.5 | <64.12 | <56.01 | |
| Co-60 | <25.78 | <24.93 | <13.32 | |
| Zn-65 | <47.87 | <70.44 | <40.87 | |
| Zr-95 | <46.11 | <40.83 | <31.15 | |
| Nb-95 | <26.72 | <24.81 | <27.7 | |
| Ru-103 | <25.14 | <24.54 | <20.1 | |
| Ru-106 | <295.1 | <180.3 | <227.4 | |
| I-131 | <61.32 | <63.8 | <50.86 | |
| Cs-134 | <23.87 | <24.7 | <19.5 | |
| Cs-137 | <30.62 | <32.08 | <20.66 | |
| Ba/La-140 | <51.6 | <54.54 | <30.21 | |
| Ce-141 | <34.8 | <32.37 | <28.33 | |
| Ce-144 | <123 | <114 | <88.3 | |
| Ra-226 | <422.3 | <422.2 | 808±281.7 | |
| Ac-228 | <59.72 | <61.8 | <76.08 | |
| DATE | 16-Jun-05 | 17-Jun-05 | 17-Jun-05 | |

| Radionuclide | CAT FISH | WHITE PERCH | BLUE CRAB | AMER. EEL |
|---|---|---|---|---|
| Be-7 | <136 | <200.3 | <195.7 | <206.7 |
| K-40 | 3397±273.6 | 6130±404.2 | 5005±467.1 | 3917±371.6 |
| Mn-54 | <11.98 | <20.86 | <19.66 | <20.4 |
| Co-58 | <22.92 | <25.79 | <30.99 | <22.98 |
| Fe-59 | <65.66 | <86.85 | <65.85 | <63.58 |
| Co-60 | <13.31 | <20.79 | <29.79 | <19.88 |
| Zn-65 | <33 | <25.67 | <56.69 | <48.82 |
| Zr-95 | <29.88 | <40.14 | <52.15 | <38.43 |
| Nb-95 | <21.04 | <33.11 | <28.61 | <29.53 |
| Ru-103 | <21.54 | <28.89 | <35.68 | <28.07 |
| Ru-106 | <161.9 | <226.6 | <276.3 | <250.2 |
| I-131 | <242.5 | <330 | <222.2 | <138.3 |
| Cs-134 | <15.24 | <21.32 | <16.46 | <19.84 |
| Cs-137 | <15.65 | <15.96 | <20.84 | <19.05 |
| Ba/La-140 | <119.2 | <94.55 | <186.6 | <71.64 |
| Ce-141 | <32 | <45.77 | <53.36 | <38.66 |
| Ce-144 | <40.6 | <87.8 | <117 | <103 |
| Ra-226 | 399.5±186.3 | 500.2±244.1 | 435.5±280.9 | 710.8±319.1 |
| Ac-228 | <42.62 | <83.5 | <93.48 | <62.65 |
| DATE | 4-Aug-05 | 4-Aug-05 | 11-Aug-05 | 17-Aug-05 |

* Indicates naturally occurring.

**TABLE B-16**

**ANNUAL SUMMARY, NON-RECS SAMPLE RESULTS 2005**

| SAMPLE MEDIUM (UNITS) | NUCLIDE DETECTED | LLD | INDICATOR LOCATIONS AVG. OF POSITIVE SAMPLES | HIGHEST POSITIVE SAMPLE | LOWEST POSTITIVE SAMPLE | NO. OF POSITIVE SAMPLES | TOTAL NO. OF SAMPLES | CONTROL LOCATIONS AVG. OF POSITIVE SAMPLES | HIGHEST POSITIVE SAMPLE | LOWEST POSITIVE SAMPLE | NO. OF POSITIVE SAMPLES | TOTAL NO. OF SAMPLES | HISTORICAL AVG VALUE* INDICATOR | CONTROL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AQUATIC VEGETATION (pCi/kg - WET) | Co-60 | NONE | <Lc | <Lc | <Lc | 0 | 5 | <Lc | <Lc | <Lc | <Lc | 5 | 22.8 | $< L_c$ |
| | I-131 | 100 | <Lc | <Lc | <Lc | 0 | 5 | <Lc | <Lc | <Lc | <Lc | 5 | 92 | 24.2 |
| | Cs-134 | 100 | <Lc | <Lc | <Lc | 0 | 5 | <Lc | <Lc | <Lc | <Lc | 5 | $< L_c$ | $< L_c$ |
| | Cs-137 | 100 | 17 | 17 | 17 | 1 | 5 | <Lc | <Lc | <Lc | <Lc | 5 | 27.7 | 72.7 |
| BOTTOM SEDIMENT (pCi/kg - DRY) | Co-60 | NONE | <Lc | <Lc | <Lc | 0 | 6 | <Lc | <Lc | <Lc | <Lc | 2 | 82 | $< L_c$ |
| | Cs-134 | 150 | <Lc | <Lc | <Lc | 0 | 6 | <Lc | <Lc | <Lc | <Lc | 2 | 48.4 | 44.7 |
| | Cs-137 | 180 | 426 | 737 | 278 | 6 | 6 | <Lc | <Lc | <Lc | <Lc | 2 | 489.4 | 107.9 |
| SOIL (pCi/kg - DRY) | Co-60 | NONE | <Lc | <Lc | <Lc | 0 | 2 | <Lc | <Lc | <Lc | <Lc | 1 | $< L_c$ | $< L_c$ |
| | Cs-134 | 150 | <Lc | <Lc | <Lc | 0 | 2 | <Lc | <Lc | <Lc | <Lc | 1 | $< L_c$ | $< L_c$ |
| | Cs-137 | 180 | 15 | 15 | 15 | 1 | 2 | <Lc | <Lc | <Lc | <Lc | 1 | 129 | 86.6 |
| PRECIPITATION (pCi/L) | H-3 | 2000 | <Lc | <Lc | <Lc | 0 | 3 | <Lc | <Lc | <Lc | 0 | 3 | 261 | 411 |
| | Co-60 | 15 | <Lc | <Lc | <Lc | 0 | 4 | <Lc | <Lc | <Lc | 0 | 4 | $< L_c$ | $< L_c$ |
| | Cs-134 | 15 | <Lc | <Lc | <Lc | 0 | 4 | <Lc | <Lc | <Lc | 0 | 4 | $< L_c$ | $< L_c$ |
| | Cs-137 | 18 | <Lc | <Lc | <Lc | 0 | 4 | <Lc | <Lc | <Lc | 0 | 4 | $< L_c$ | $< L_c$ |
| SPECIAL WATER (pCi/L) | H-3 | 2000 | <Lc | <Lc | <Lc | 0 | 15 | NA | NA | NA | NA | NA | 213 | NA |
| | Co-60 | 15 | <Lc | <Lc | <Lc | 0 | 37 | NA | NA | NA | NA | NA | $< L_c$ | $< L_c$ |
| | Cs-134 | 15 | <Lc | <Lc | <Lc | 0 | 37 | NA | NA | NA | NA | NA | $< L_c$ | $< L_c$ |
| | Cs-137 | 18 | <Lc | <Lc | <Lc | 0 | 37 | NA | NA | NA | NA | NA | $< L_c$ | $< L_c$ |
| | Sr-90 | NONE | <Lc | <Lc | <Lc | 0 | 4 | NA | NA | NA | NA | NA | NA | NA |

* Average of positive values for 1995 - 2004
** Detected at control location 1999, AND 2001.

NA - Data not available.
Lc - Critical Level, which is less than the required Lower Limit of Detection (LLD), unless otherwise noted.

## TABLE B-17
## MILCH ANIMAL CENSUS
## 2004

THERE ARE NO ANIMALS PRODUCING MILK FOR HUMAN CONSUMPTION WITHIN FIVE MILES OF INDIAN POINT.

## TABLE B-18

Table B-18
Land Use Census 2005

A comprehensive survey of the of the 5 mile (8 kilometer) area surrounding the Indian Point Site was conducted during the 2005 Spring, Summer and Fall months in accordance with the Indian ODCM

Methodology:

Visual inspections were made of the 5-mile area around the Indian Point Site during routine sample collections and emergency plan equipment inspections in the area throughout the year.

Obtained information from the New York Agricultural Statistic Service on milching animals within the 5-mile area surrounding Indian Point Energy Center.

An extensive land survey was conducted of the 5-mile area in an attempt to identify new residential areas, commercial developments and to identify milch animals in pasture. Previous locations were visited and verified by dispatching Nuclear Environmental Technicians to the various locations.

Note: This was done while performing quarterly environmental badge change out and field inspections through out the 4 surrounding counties.

· Orange County was surveyed during through the summer and fall.

· Rockland County was surveyed during summer and fall.

· Putnam County was surveyed during the and summer and fall.

· Westchester County was surveyed during the summer and summer and fall.

Note: An aerial survey was not conducted of the 5-mile area this year.

Results:

The 2005 land use census indicated there were new residences that were closer in proximity to IPEC. NEM performed a complete nearest residence survey with updated distances. The new survey information is being updated in the ODCM. and is attached to this document.
No milch animals were observed during this reporting period within the 5-mile zone or listed in the New York Agricultural Statistic Service

## TABLE B-18

## INDIAN POINT ENERGY CENTER

## UNRESTRICTED AREA BOUNDARY AND NEAREST RESIDENCES 2005

| sector | Compass Point | Distance to site Boundary from Unit 2 Plant Vent (In meters) | Distance to site Boundary from Unit 3 Plant Vent (In meters) | Distance to nearest resident, from Unit 1 superheater in meters | Address of nearest resident, Dec 2004 Census |
|---|---|---|---|---|---|
| 1 | N | RIVER | RIVER | 1788.1 | 41 River Road Tomkins Cove |
| 2 | NNE | RIVER | RIVER | 3111.3 | Chateau Rive Apts. John St. Peekskill |
| 3 | NE | 550 | 636 | 1907.3 | 122 Lower South St. Peekskill |
| 4 | ENE | 600 | 775 | 1478.2 | 1018 Lower South St. Peekskill |
| 5 | E | 662 | 785 | 1370.9 | 1103 Lower South St. Peekskill |
| 6 | ESE | 569 | 622 | 715.2 | 461 Broadway Buchanan |
| 7 | SE | 553 | 564 | 1168.2 | 223 First St. Buchanan |
| 8 | SSE | 569 | 551 | 1239.7 | 5 Pheasant's Run Buchanan |
| 9 | S | 700 | 566 | 1132.5 | 320 Broadway Verplanck |
| 10 | SSW | 755 | 480 | 1573.5 | 240 Eleventh St. Verplanck |
| 11 | SW | 544 | 350 | 3015.9 | 29 Church St. Tomkins Cove |
| 12 | WSW | RIVER | RIVER | 2169.6 | 9 West Shore Dr. Tomkins Cove |
| 13 | W | RIVER | RIVER | 1918.7 | 712 Rt. 9W Tomkins Cove |
| 14 | WNW | RIVER | RIVER | 1752.4 | 770 Rt. 9W Tomkins Cove |
| 15 | NW | RIVER | RIVER | 1692.7 | 807 Rt. 9W Tomkins Cove |
| 16 | NNW | RIVER | RIVER | 1609.3 | 4 River Rd. Tomkins Cove |

# APPENDIX C

## HISTORICAL TRENDS

# APPENDIX C

The past ten years of historical data for various radionuclides and media are presented both in tabular form and in graphical form to facilitate the comparison of 2005 data with historical values. Although other samples were taken and analyzed, values were only tabulated and plotted where positive indications were present.

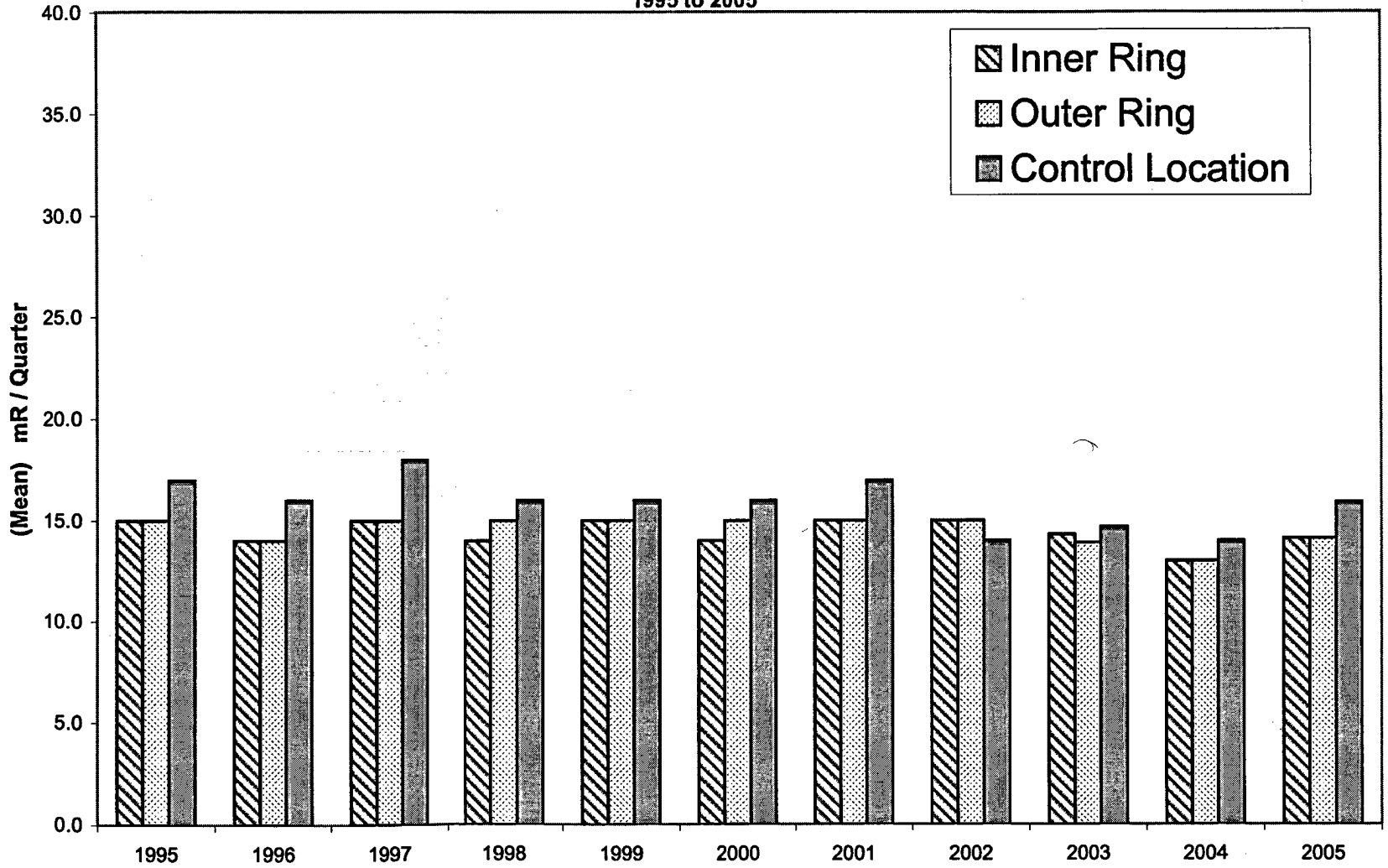
Averaging only the positive values in these tables can result in a biased high value, especially, when the radionuclide is detected in only one or two quarters for the year. This bias can be seen in Table and Figure C-6 where the values reflected for 2004 are from a single sample of broadleaf vegetation that indicated Cs-137. Also in Table and Figure C-7 where the values reflected for the historical average are base upon the one positive sample of Cs-137 in fish and invertebrates in 1995.

## TABLE C-1

## DIRECT RADIATION ANNUAL SUMMARY
## 1995 - 2005

| Year | Average Quarterly Dose (mR/Quarter) Inner Ring | Outer Ring | Control Location |
|---|---|---|---|
| 1995 | 15.0 | 15.0 | 17.0 |
| 1996 | 14.0 | 14.0 | 16.0 |
| 1997 | 15.0 | 15.0 | 18.0 |
| 1998 | 14.0 | 15.0 | 16.0 |
| 1999 | 15.0 | 15.0 | 16.0 |
| 2000 | 14.0 | 15.0 | 16.0 |
| 2001 | 15.0 | 15.0 | 17.0 |
| 2002 | 15.0 | 15.0 | 14.0 |
| 2003 | 14.3 | 13.9 | 14.7 |
| 2004 | 13.0 | 13.0 | 14.0 |
| **2005** | **14.1** | **14.1** | **15.9** |
| **Historical Average 1995-2004** | 14.4 | 14.6 | 15.9 |

**FIGURE C-1**
**DIRECT RADIATION**
**1995 to 2005**



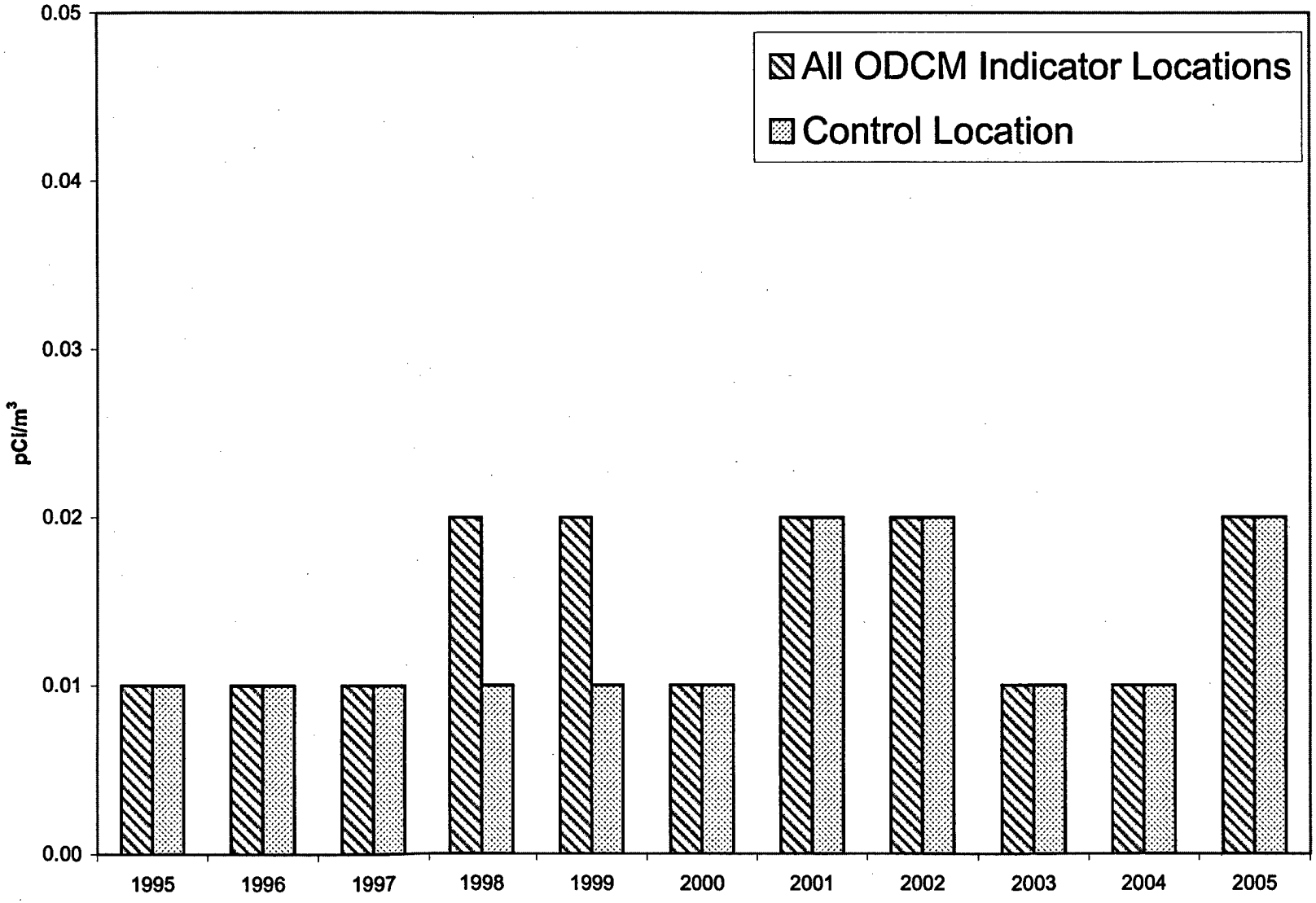
## TABLE C-2

## RADIONUCLIDES IN AIR
## 1995 - 2005
## ($pCi/m^3$)

| Year | Gross Beta | | Cs-137 | |
|---|---|---|---|---|
| | All ODCM Indicator Locations | Control Location | All ODCM Indicator Locations | Control Location |
| 1995 | 0.01 | 0.01 | $< L_c$ | $< L_c$ |
| 1996 | 0.01 | 0.01 | $< L_c$ | $< L_c$ |
| 1997 | 0.01 | 0.01 | $< L_c$ | $< L_c$ |
| 1998 | 0.02 | 0.01 | $< L_c$ | $< L_c$ |
| 1999 | 0.02 | 0.01 | $< L_c$ | $< L_c$ |
| 2000 | 0.01 | 0.01 | $< L_c$ | $< L_c$ |
| 2001 | 0.02 | 0.02 | $< L_c$ | $< L_c$ |
| 2002 | 0.02 | 0.02 | $< L_c$ | $< L_c$ |
| 2003 | 0.01 | 0.01 | $< L_c$ | $< L_c$ |
| 2004 | 0.01 | 0.01 | $< L_c$ | $< L_c$ |
| **2005** | **0.02** | **0.02** | **$< L_c$** | **$< L_c$** |
| **Historical Average 1995-2004** | 0.01 | 0.01 | $< L_c$ | $< L_c$ |

Critical Level ($L_c$) is less than the ODCM required LLD.
$<L_c$ indicates no positive values above sample critical level.

**FIGURE C-2**
**RADIONUCLIDES IN AIR - GROSS BETA**
**1995 to 2005**




* Includes ODCM and non-ODCM indicator locations.

Gross Beta ODCM required LLD = 0.01 pCi/m$^3$

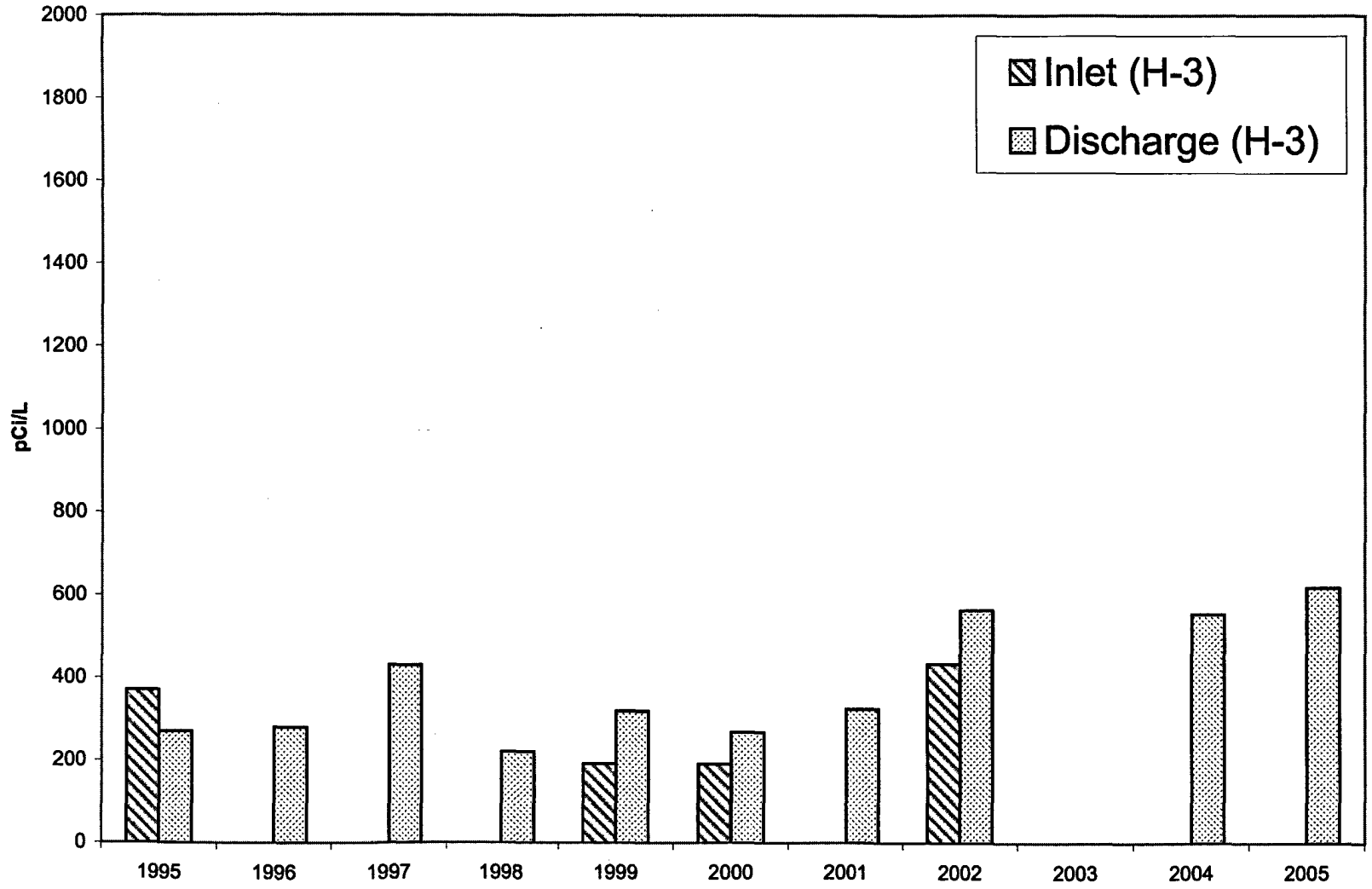
## TABLE C-3

## RADIONUCLIDES IN HUDSON RIVER WATER
## 1995 - 2005
## (pCi/L)

| Year | Tritium (H-3) | | Cs-137 | |
|---|---|---|---|---|
| | Inlet | Discharge | Inlet | Discharge |
| 1995 | 370 | 270 | $< L_c$ | $< L_c$ |
| 1996 | $< L_c$ | 280 | $< L_c$ | $< L_c$ |
| 1997 | $< L_c$ | 430 | $< L_c$ | $< L_c$ |
| 1998 | $< L_c$ | 220 | $< L_c$ | $< L_c$ |
| 1999 | 191 | 318 | $< L_c$ | $< L_c$ |
| 2000 | 190 | 267 | $< L_c$ | $< L_c$ |
| 2001 | $< L_c$ | 323 | $< L_c$ | $< L_c$ |
| 2002 | 432 | 562 | $< L_c$ | $< L_c$ |
| 2003 | $< L_c$ | $< L_c$ | $< L_c$ | $< L_c$ |
| 2004 | $< L_c$ | 553 | $< L_c$ | $< L_c$ |
| **2005** | **$< L_c$** | **618** | **$< L_c$** | **$< L_c$** |
| **Historical Average 1995-2004** | 296 | 358 | $< L_c$ | $< L_c$ |

Critical Level ($L_c$) is less than the ODCM required LLD.
$<L_c$ indicates no positive values above sample critical level.

**FIGURE C-3**
**HUDSON RIVER WATER - TRITIUM**
**1995 to 2005**




Tritium ODCM required LLD = 3000 pCi/L

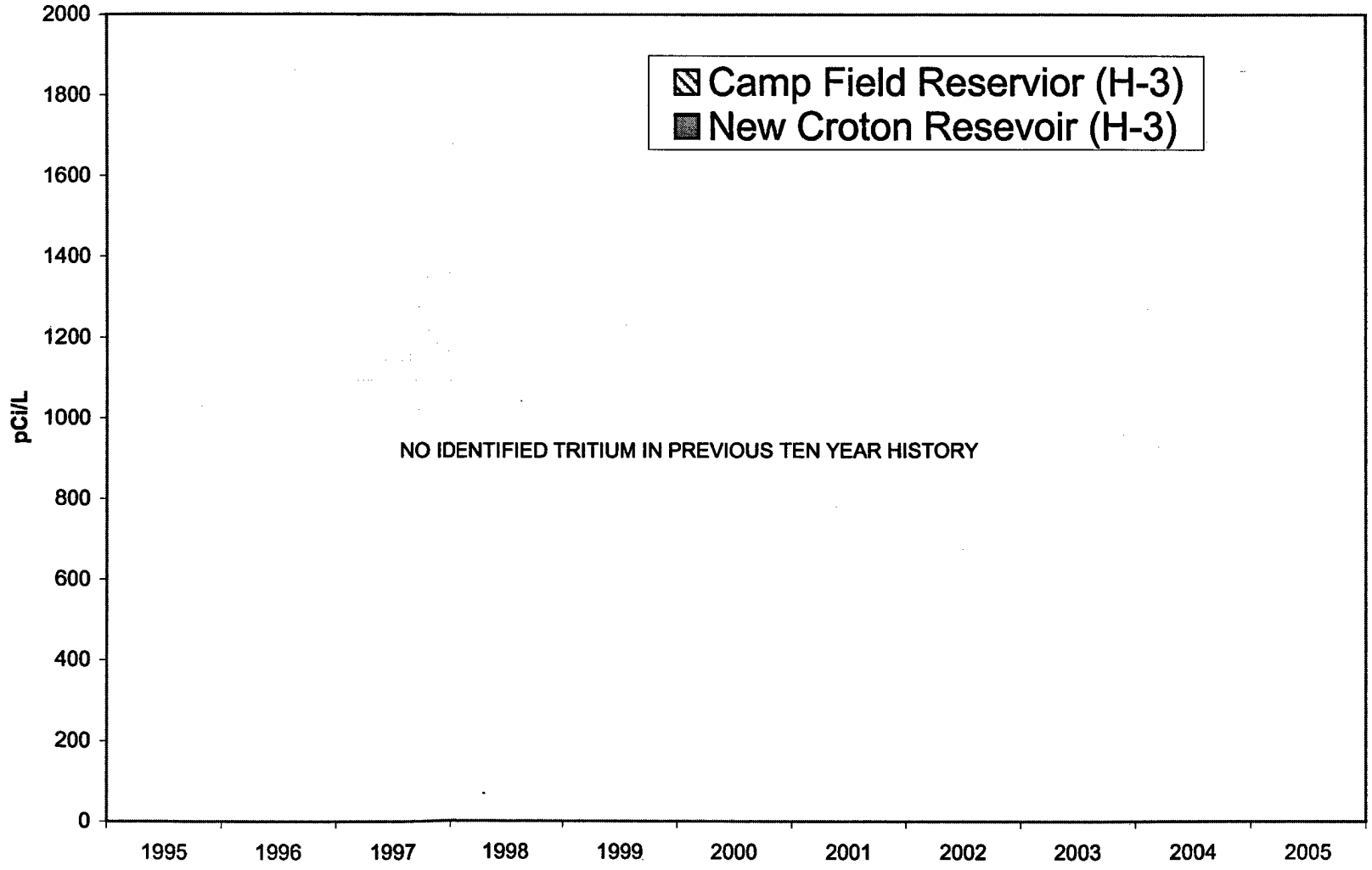
## TABLE C-4

## RADIONUCLIDES IN DRINKING WATER
## 1995 - 2005
## (pCi/L)

| Year | Tritium (H-3) | Cs-137 |
|---|---|---|
| 1995 | $< L_c$ | $< L_c$ |
| 1996 | $< L_c$ | $< L_c$ |
| 1997 | $< L_c$ | $< L_c$ |
| 1998 | $< L_c$ | $< L_c$ |
| 1999 | $< L_c$ | $< L_c$ |
| 2000 | $< L_c$ | $< L_c$ |
| 2001 | $< L_c$ | $< L_c$ |
| 2002 | $< L_c$ | $< L_c$ |
| 2003 | $< L_c$ | $< L_c$ |
| 2004 | $< L_c$ | $< L_c$ |
| **2005** | $< L_c$ | $< L_c$ |
| **Historical Average 1995-2004** | $< L_c$ | $< L_c$ |

Critical Level ($L_c$) is less than the ODCM required LLD.
$<L_c$ indicates no positive values above sample critical level.

**FIGURE C-4**
**DRINKING WATER - TRITIUM**
**1995 to 2005**




Tritium ODCM required LLD = 2000 pCi/L

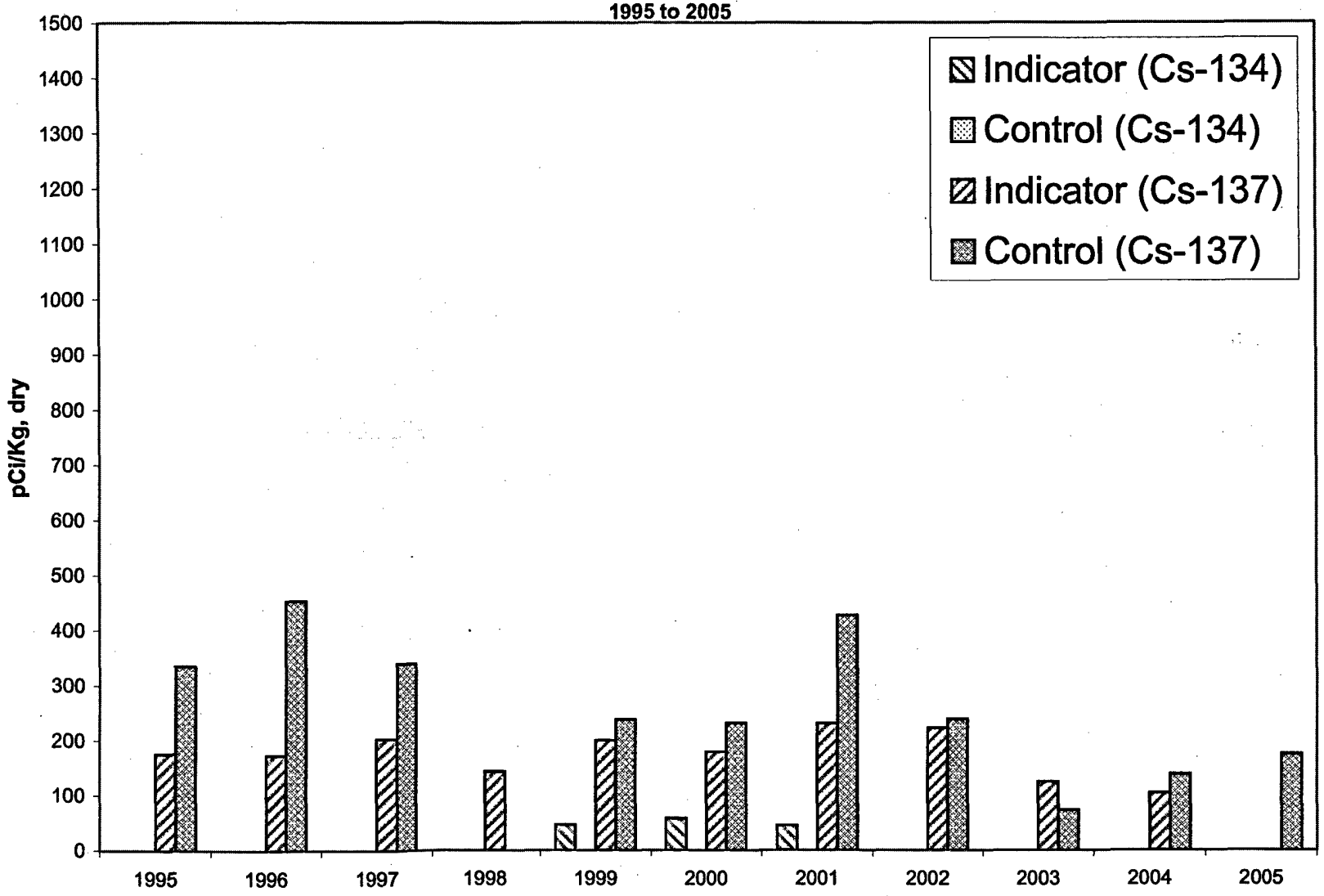
## TABLE C-5

## RADIONUCLIDES IN SHORELINE SOIL
## 1995 - 2005
## (pCi/Kg, dry)

| | Cs-134 | | Cs-137 | |
|---|---|---|---|---|
| Year | Indicator | Control | Indicator | Control |
| 1995 | $< L_c$ | $< L_c$ | 176 | 335 |
| 1996 | $< L_c$ | $< L_c$ | 173 | 453 |
| 1997 | $< L_c$ | $< L_c$ | 203 | 340 |
| 1998 | $< L_c$ | $< L_c$ | 143 | $< L_c$ |
| 1999 | 46 | $< L_c$ | 200 | 238 |
| 2000 | 58 | $< L_c$ | 179 | 231 |
| 2001 | 45 | $< L_c$ | 230 | 427 |
| 2002 | $< L_c$ | $< L_c$ | 221 | 238 |
| 2003 | $< L_c$ | $< L_c$ | 124 | 73 |
| 2004 | $< L_c$ | $< L_c$ | 104 | 138 |
| **2005** | **$< L_c$** | **$< L_c$** | **$< L_c$** | **174** |
| **Historical Average 1995-2004** | 50 | $< L_c$ | 175 | 275 |

Critical Level ($L_c$) is less than the RETS required LLD.
$< L_c$ indicates no positive values above sample critical level.

**FIGURE C-5**
**RADIONUCLIDES IN SHORELINE SOIL**
**1995 to 2005**




Cs-134 ODCM required LLD = 150 pCi/Kg, dry
Cs-137 ODCM required LLD = 175 pCi/Kg, dry

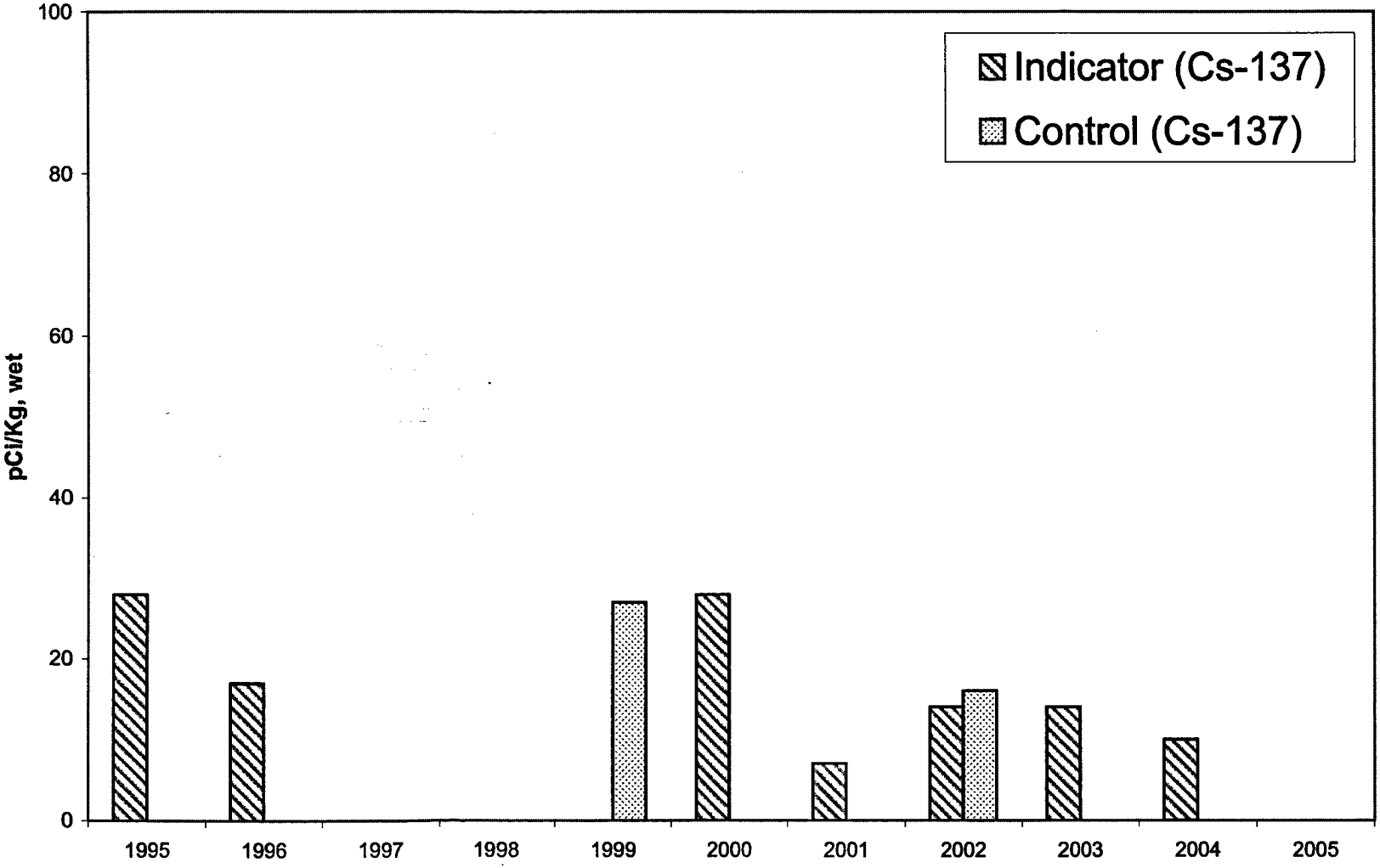
## TABLE C-6

## RADIONUCLIDES IN BROAD LEAF VEGETATION
## 1995 - 2005
## (pCi/Kg, wet)

| | Cs-137 | |
|---|---|---|
| Year | Indicator | Control |
| 1995 | 28 | $< L_c$ |
| 1996 | 17 | $< L_c$ |
| 1997 | $< L_c$ | $< L_c$ |
| 1998 | $< L_c$ | $< L_c$ |
| 1999 | $< L_c$ | 27 |
| 2000 | 28 | $< L_c$ |
| 2001 | 7 | $< L_c$ |
| 2002 | 14 | 16 |
| 2003 | 14 | $< L_c$ |
| 2004 | 10 | $< L_c$ |
| **2005** | **$< L_c$** | **$< L_c$** |
| **Historical Average 1995-2004** | 17 | 22 |

Critical Level ($L_c$) is less than the ODCM required LLD.
$<L_c$ indicates no positive values above sample critical level.

**FIGURE C-6**
**BROAD LEAF VEGETATION - Cs-137**
**1995 to 2005**




ODCM required LLD = 80 pCi/Kg, wet

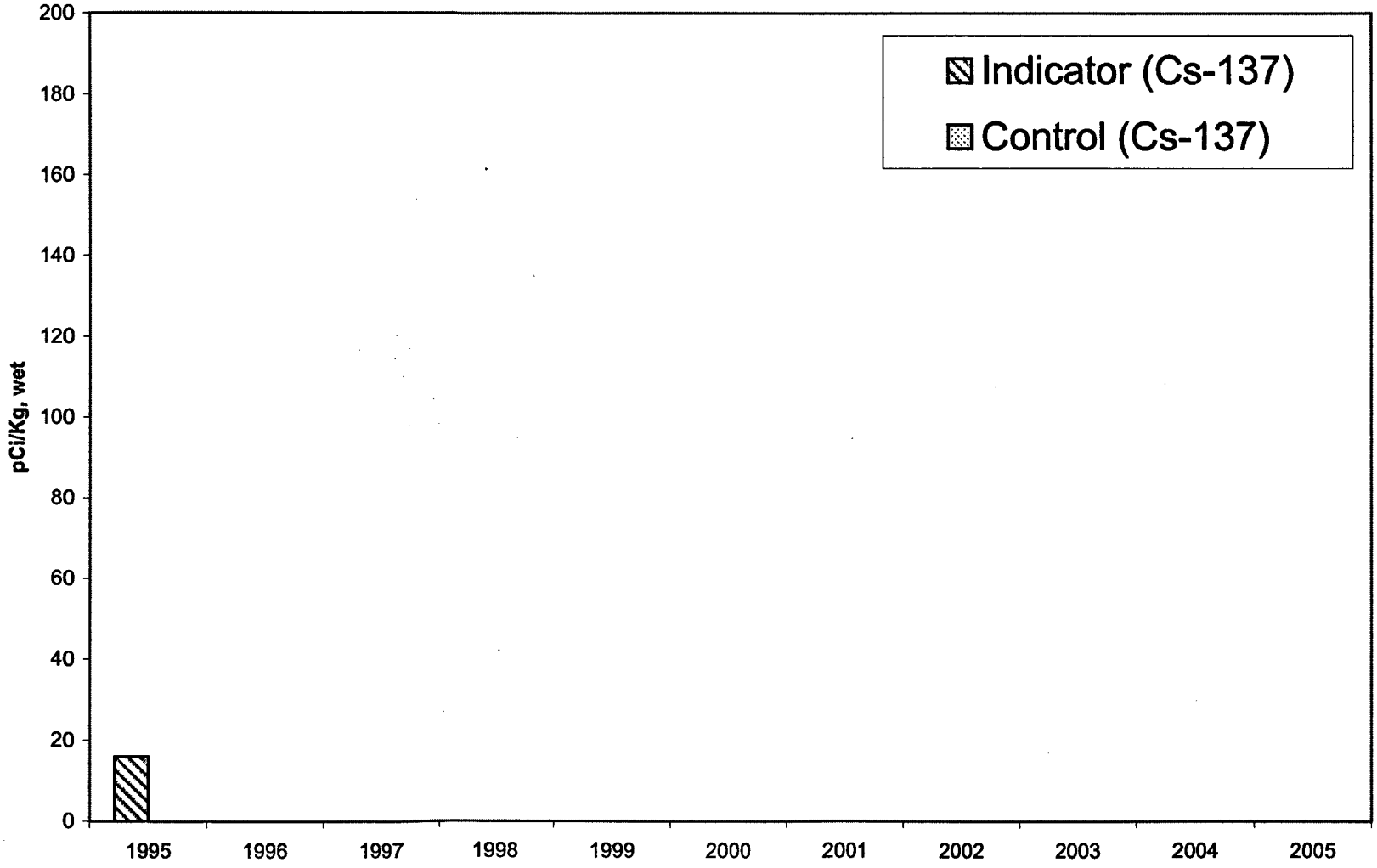
## TABLE C-7

## RADIONUCLIDES IN FISH AND INVERTEBRATES
## 1995 - 2005

| | Cs-137 | |
|---|---|---|
| Year | Indicator | Control |
| 1995 | 16 | $< L_c$ |
| 1996 | $< L_c$ | $< L_c$ |
| 1997 | $< L_c$ | $< L_c$ |
| 1998 | $< L_c$ | $< L_c$ |
| 1999 | $< L_c$ | $< L_c$ |
| 2000 | $< L_c$ | $< L_c$ |
| 2001 | $< L_c$ | $< L_c$ |
| 2002 | < Lc | < Lc |
| 2003 | $< L_c$ | $< L_c$ |
| 2004 | $< L_c$ | $< L_c$ |
| **2005** | **$< L_c$** | **$< L_c$** |
| **Historical Average 1995-2004** | 16 | $< L_c$ |

Critical Level ($L_c$) is less than the ODCM required LLD.
$<L_c$ indicates no positive values above sample critical level.

**FIGURE C-7**
**FISH AND INVERTEBRATES - Cs-137**
**1995 to 2005**




Cs-137 ODCM required LLD = 150 pCi/Kg, wet

# APPENDIX D

## INTERLABORATORY COMPARISON PROGRAM

## D. QA/QC PROGRAM

### D.1. PROGRAM DESCRIPTION

The Offsite Dose Calculation Manual (ODCM), Part 1, Section 5.3 requires that the licensee participate in an Interlaboratory Comparison Program. The Interlaboratory Comparison Program shall include sample media for which samples are routinely collected and for which comparison samples are commercially available. Participation in an Interlaboratory Comparison Program ensures that independent checks on the precision and accuracy of the measurement of radioactive material in the environmental samples are performed as part of the Quality Assurance Program for environmental monitoring. To fulfill the requirement for an Interlaboratory Comparison Program, the JAF Environmental Laboratory has engaged the services of two independent laboratories to provide quality assurance comparison samples. The two laboratories are Analytics, Incorporated in Atlanta, Georgia and the U.S. Department of Commerce's National Institute of Standards and Technology (NIST) in Gaithersburg, Maryland.

Analytics supplies sample media as blind sample spikes, which contain certified levels of radioactivity unknown to the analysis laboratory. These samples are prepared and analyzed using standard laboratory procedures. The results are submitted to Analytics, which issues a statistical summary report. The JAFNPP Environmental Laboratory uses predetermined acceptance criteria methodology for evaluating the laboratory's performance for Analytic's sample results.

In addition to the Analytics Program, the JAF Environmental Laboratory participates in the NEI/NIST Measurement Assurance Program. In 1987, the nuclear industry established a Measurement Assurance Program at the National Bureau of Standards (now the National Institute of Standards and Technology) to provide sponsoring nuclear utilities an independent verification, traceable to NIST, of their capability to make accurate measurements of radioactivity, as described in NRC Regulatory Guide 4.15. The program includes distribution to sponsoring utilities, approximately six times a year. The samples are prepared by NIST to present specific challenges to participating laboratories. For 2005, the two mixed gamma samples analyzed tested the ability of the JAF Environmental Laboratory to accurately account for coincidence summing from Cs-134. NIST supplies sample media as blind sample spikes. These samples are prepared and analyzed by the JAF Environmental Laboratory and the results are submitted to the Entergy Nuclear Northeast representative, who uses predetermined acceptance criteria methodology for evaluating the laboratory's performance. The performance results along with the NIST Report of Test (Certifies what activities are present in the sample) are forwarded to the laboratory.

## D.2. PROGRAM SCHEDULE

**Table D-1**

| SAMPLE MEDIA | LABORATORY ANALYSIS | SAMPLE PROVIDER ANALYTICS |
|---|---|---|
| Water | Gross Beta | 1 |
| Water | Tritium | 1 |
| Water | I-131 | 2 |
| Water | Mixed Gamma | 3 |
| Air | Gross Beta | 2 |
| Air | I-131 | 2 |
| Air | Mixed Gamma | 3 |
| Milk | I-131 | 2 |
| Milk | Mixed Gamma | 2 |
| Soil | Mixed Gamma | 1 |
| Vegetation | Mixed Gamma | 1 |
| **TOTAL SAMPLE INVENTORY** | | **20** |

## ACCEPTANCE CRITERIA

Each sample result is evaluated to determine the accuracy and precision of the laboratory's analysis result. The sample evaluation method is discussed below.

### SAMPLE RESULTS EVALUATION

Samples provided by Analytics and NIST are evaluated using what is specified as the NRC method. This method is based on the calculation of the ratio of results reported by the participating laboratory (QC result) to the Vendor Laboratory Known value (reference result).

An Environmental Laboratory analytical result is evaluated using the following calculation:

The value for the error resolution is calculated.

$$\text{The error resolution} = \frac{\text{Reference Result}}{\text{Reference Results Error}}$$

Using the appropriate row under the Error Resolution column in Table D-2 below, a corresponding Ratio of Agreement interval is given.

The value for the ratio is then calculated.

$$\text{Ratio of Agreement} = \frac{\text{QC Result}}{\text{Reference Result}}$$

If the value falls within the agreement interval, the result is acceptable.

**TABLE D-2**

| ERROR RESOLUTION | RATIO OF AGREEMENT |
|---|---|
| ≤3 | 0.4-2.5 |
| 3.1 to 7.5 | 0.5-2.0 |
| 7.6 to 15.5 | 0.6-1.66 |
| 15.6 to 50.5 | 0.75-1.33 |
| 50.6 to 200 | 0.8-1.25 |
| >200 | 0.85-1.18 |

This acceptance test is generally referred to as the "NRC" method. The acceptance criteria is contained in Procedure DVP-04.01 and was taken from the Criteria of Comparing Analytical Results (USNRC) and Bevington, P.R., Data Reduction and Error Analysis for the Physical Sciences, McGraw-Hill, New York, (1969). The NRC method generally results in an acceptance range of approximately ± 25% of the Known value when applied to sample results from the Analytics and NIST. Interlaboratory Comparison Program. This method is used as the procedurally required assessment method and requires the generation of a nonconformity report when results are unacceptable.

## D.3. PROGRAM RESULTS SUMMARY

The Interlaboratory Comparison Program numerical results are provided on Table D-3,4 and 5.

### ANALYTICS QA SAMPLES RESULTS

Eighteen QA blind spike samples were analyzed as part of Analytics 2005 Interlaboratory Comparison Program. The following sample media were evaluated as part of the comparison program.

Air Charcoal Cartridge: I-131
Air Particulate Filter: Mixed Gamma Emitters, Gross Beta
Water: I-131, Mixed Gamma Emitters, Tritium, Gross Beta
Soil: Mixed Gamma Emitters
Milk: I-131, Mixed Gamma Emitters
Vegetation: Mixed Gamma Emitters

The JAF Environmental Laboratory performed 79 individual analyses on the eighteen QA samples. Of the 79 analyses performed, 79 were in agreement using the NRC acceptance criteria for a 100% agreement ratio.

There were no non-conformities in the 2005 program.

### NIST QA SAMPLES RESULTS

In 2005, JAF Environmental Laboratory participated in the NEI/NIST Measurement Assurance Program. Two QA blind spike samples were analyzed. The following sample media were evaluated as part of the comparison program.

Air Particulate Filter: Mixed Gamma Emitters
Water: Mixed Gamma Emitters

The JAF Environmental Laboratory performed 10 individual analyses on the two QA samples. Of the 10 analyses performed, 10 were in agreement using the NRC acceptance criteria for a 100% agreement ratio.

There were no non-conformities in the 2005 program.

## Table D-3 NUMERICAL RESULTS TABLES

**TABLE D-3**
**INTERLABORATORY INTERCOMPARISON PROGRAM**
**Gross Beta Analysis of Air Particulate Filters (pCi/filter)**

| DATE | JAF ENV ID NO. | MEDIUM | ANALYSIS | JAF RESULT (1) | REFERENCE LAB* (2) | RATIO (3) |
|---|---|---|---|---|---|---|
| 6/9/05 | E-4583-05 | AIR pCi/filter | GROSS BETA | 142.4 ± 1.8<br>146.6 ± 1.8<br>145.2 ± 1.8<br>Mean = 144.7 ± 1.0 | 138.0 ± 2.3 | 1.05 A |
| 12/8/05 | E-4824-05 | AIR pCi/filter | GROSS BETA | 202.8 ± 3.0<br>204.7 ± 3.0<br>206.5 ± 3.0<br>Mean = 204.7 ± 1.7 | 186.0 ± 3.1 | 1.10 A |

(1) Results reported as activity ±1 sigma.
(2) Results reported as activity ±1 sigma.
(3) Ratio = Reported/Analytics (See Section 8.3).
(*) Sample provided by Analytics, Inc.
(A) Evaluation Results, Acceptable.

**TABLE D-4**
**INTERLABORATORY INTERCOMPARISON PROGRAM**
**Tritium Analysis Water (pCi/liter)**

| DATE | JAF ENV ID NO. | MEDIUM | ANALYSIS | JAF RESULT (1) | REFERENCE LAB* (2) | RATIO (3) |
|---|---|---|---|---|---|---|
| 3/17/05 | E-4487-05 | WATER pCi/liter | H-3 | 6073 ± 176<br>5887 ± 175<br>5925 ± 175<br>Mean = 5962 ± 101 | 6040 ± 200 | 0.99 A |

(1) Results reported as activity ±1 sigma. Sample analyzed by JAF Environmental Laboratory
(2) Results reported as activity ±1 sigma.
(3) Ratio = Reported/Analytics (See Section 8.3).
(*) Sample provided by Analytics, Inc.
(A) Evaluation Results, Acceptable.

**TABLE D-5**
**INTERLABORATORY INTERCOMPARISON PROGRAM**
**Iodine Analysis of Water, Air and Milk**

| DATE | JAF ENV ID NO. | MEDIUM | ANALYSIS | JAF RESULT (1) | REFERENCE LAB* (2) | RATIO (3) |
|---|---|---|---|---|---|---|
| 3/17/05 | E-4488-05 | WATER pCi/liter | I-131** | 59.4 ± 1.8<br>63.3 ± 2.4<br>64.6 ± 1.8<br>Mean = 62.4 ± 1.1 | 65.9 ± 1.1 | 0.95 A |
| 6/9/05 | E-4586-05 | AIR pCi/cc | I-131 | 102.0 ± 5.6<br>98.7 ± 4.8<br>88.1 ± 4.4<br>Mean = 96.3 ± 2.9 | 92.5 ± 1.5 | 1.04 A |
| 6/9/05 | E-4584-05 | MILK pCi/liter | I-131** | 80.4 ± 2.2<br>81.9 ± 2.4<br>81.3 ± 2.7<br>Mean = 81.2 ± 1.4 | 86.9 ± 1.5 | 0.93 A |
| 9/15/05 | E-4716-05 | AIR pCi/cc | I-131 | 65.2 ± 4.0<br>58.6 ± 4.7<br>66.7 ± 3.6<br>Mean = 63.5 ± 2.4 | 63.4 ± 1.1 | 1.00 A |
| 9/15/05 | E-4713-05 | WATER pCi/liter | I-131** | 77.0 ± 1.6<br>78.0 ± 2.0<br>75.6 ± 2.1<br>Mean = 76.9 ± 1.1 | 78.2 ± 1.3 | 0.98 A |
| 9/15/05 | E-4715-05 | MILK pCi/liter | I-131** | 86.4 ± 1.7<br>90.6 ± 1.9<br>84.6 ± 1.8<br>Mean = 87.2 ± 1.0 | 94.3 ± 1.6 | 0.92 A |

(1) Results reported as activity ±1 sigma.
(2) Results reported as activity ±1 sigma.
(3) Ratio = Reported/Analytics (See Section 8.3).
(*) Sample provided by Analytics, Inc.
(**) Result determined by Resin Extraction/Gamma Spectral Analysis.
(A) Evaluation Results, Acceptable.

**TABLE D-5 (cont)**
**INTERLABORATORY INTERCOMPARISON PROGRAM**
**Gamma Analysis Water (pCi/liter)**

| DATE | JAF ENV ID NO. | MEDIUM | ANALYSIS | JAF RESULT (1) | REFERENCE LAB* (2) | RATIO (3) |
|---|---|---|---|---|---|---|
| 3/17/05 | E-4488-05 | WATER pCi/liter | Ce-141 | 222.0 ± 11.4<br>248.0 ± 11.8<br>236.0 ± 9.4<br>Mean = 235.3 ± 6.3 | 221 ± 3.7 | 1.06 A |
| | | | Cr-51 | 278.0 ± 53.9<br>295.0 ± 48.7<br>262.0 ± 38.5<br>Mean = 278.3 ± 27.4 | 322 ± 5.4 | 0.86 A |
| | | | Cs-134 | 128.0 ± 9.6<br>113.0 ± 14.6<br>138.0 ± 6.8<br>Mean = 126.3 ± 6.2 | 134 ± 2.2 | 0.94 A |
| | | | Cs-137 | 112.0 ± 8.0<br>121.0 ± 7.9<br>130.0 ± 6.3<br>Mean = 121.0 ± 4.3 | 125 ± 2.1 | 0.97 A |
| | | | Mn-54 | 157.0 ± 9.2<br>162.0 ± 9.0<br>164.0 ± 7.0<br>Mean = 161.0 ± 4.9 | 154 ± 2.6 | 1.05 A |
| | | | Fe-59 | 106.0 ± 10.0<br>114.0 ± 9.6<br>122.0 ± 7.1<br>Mean = 114.0 ± 5.2 | 107 ± 1.8 | 1.07 A |
| | | | Zn-65 | 184.0 ± 16.4<br>203.0 ± 16.4<br>179.0 ± 11.5<br>Mean = 188.7 ± 8.6 | 191 ± 3.2 | 0.99 A |
| | | | Co-60 | 136.0 ± 6.6<br>131.0 ± 6.3<br>144.0 ± 4.9<br>Mean = 137.0 ± 3.5 | 139 ± 2.3 | 0.99 A |
| | | | Co-58 | 117.0 ± 8.2<br>120.0 ± 8.0<br>112.0 ± 5.8<br>Mean = 116.3 ± 4.3 | 111 ± 1.9 | 1.05 A |

(1) Results reported as activity ±1 sigma.
(2) Results reported as activity ±1sigma.
(3) Ratio = Reported/Analytics (See Section 8.3).
(*) Sample provided by Analytics, Inc.
(A) Evaluation Results, Acceptable.

**TABLE D-5 (cont)**
**INTERLABORATORY INTERCOMPARISON PROGRAM**
**Gamma Analysis Water (pCi/liter)**

| DATE | JAF ENV ID NO. | MEDIUM | ANALYSIS | JAF RESULT (1) | REFERENCE LAB* (2) | RATIO (3) |
|---|---|---|---|---|---|---|
| 9/15/05 | E-4713 | WATER pCi/liter | Ce-141 | 292.0 ± 4.4<br>284.0 ± 9.0<br>296.0 ± 4.1<br>Mean = 290.7 ± 3.6 | 282 ± 4.7 | 1.03 A |
| | | | Cr-51 | 395.0 ± 18.2<br>411.0 ± 38.1<br>397.0 ± 16.2<br>Mean = 401.0 ± 15.1 | 408 ± 6.8 | 0.98 A |
| | | | Cs-134 | 152.0 ± 3.3<br>152.0 ± 6.3<br>153.0 ± 2.9<br>Mean = 152.3 ± 2.6 | 148 ± 2.5 | 1.03 A |
| | | | Cs-137 | 234.0 ± 3.7<br>235.0 ± 7.2<br>231.0 ± 3.5<br>Mean = 233.3 ± 2.9 | 235 ± 3.9 | 0.99 A |
| | | | Mn-54 | 119.0 ± 2.8<br>118.0 ± 5.5<br>118.0 ± 2.7<br>Mean = 118.3 ± 2.3 | 111 ± 1.9 | 1.07 A |
| | | | Fe-59 | 74.7 ± 3.1<br>77.0 ± 6.2<br>81.6 ± 3.0<br>Mean = 77.8 ± 2.5 | 74 ± 1.2 | 1.05 A |
| | | | Zn-65 | 158.0 ± 5.3<br>160.0 ± 11.0<br>163.0 ± 5.2<br>Mean = 160.3 ± 4.4 | 149 ± 2.5 | 1.08 A |
| | | | Co-60 | 201.0 ± 2.7<br>202.0 ± 5.5<br>198.0 ± 2.6<br>Mean = 200.3 ± 2.2 | 202 ± 3.4 | 0.99 A |
| | | | Co-58 | 71.6 ± 2.5<br>81.0 ± 4.6<br>79.2 ± 2.5<br>Mean = 77.3 ± 1.9 | 77 ± 1.3 | 1.00 A |

(1) Results reported as activity ±1 sigma.
(2) Results reported as activity ±1 sigma.
(3) Ratio = Reported/Analytics (See Section 8.3).
(*) Sample provided by Analytics, Inc.
(A) Evaluation Results, Acceptable.

**TABLE D-5 (cont)**
**INTERLABORATORY INTERCOMPARISON PROGRAM**
**Gamma Analysis of Air Particulate Filters (pCi/filter)**

| DATE | JAF ENV ID NO. | MEDIUM | ANALYSIS | JAF RESULT (1) | REFERENCE LAB* (2) | RATIO (3) |
|---|---|---|---|---|---|---|
| 3/17/05 | E-4489-05 | FILTER pCi/filter | Ce-141 | 160.0 ± 6.0<br>151.0 ± 5.4<br>160.0 ± 4.8<br>Mean = 157.0 ± 3.1 | 155 ± 2.6 | 1.01 A |
| | | | Cr-51 | 268.0 ± 30.8<br>259.0 ± 29.6<br>302.0 ± 23.5<br>Mean = 276.3 ± 16.3 | 226 ± 3.8 | 1.22 A |
| | | | Cs-134 | 107.0 ± 7.0<br>94.5 ± 7.1<br>102.0 ± 5.4<br>Mean = 101.2 ± 3.8 | 93.9 ± 1.6 | 1.08 A |
| | | | Cs-137 | 91.1 ± 5.6<br>88.2 ± 5.9<br>96.5 ± 4.5<br>Mean = 91.9 ± 3.1 | 87.6 ± 1.5 | 1.05 A |
| | | | Mn-54 | 115.0 ± 6.6<br>116.0 ± 7.1<br>126.0 ± 5.5<br>Mean = 119.0 ± 3.7 | 108 ± 1.8 | 1.10 A |
| | | | Fe-59 | 79.8 ± 7.9<br>89.0 ± 9.1<br>94.2 ± 6.8<br>Mean = 87.7 ± 4.6 | 75.0 ± 1.3 | 1.17 A |
| | | | Zn-65 | 150.0 ± 12.5<br>162.0 ± 14.1<br>151.0 ± 10.0<br>Mean = 154.3 ± 7.1 | 134 ± 2.2 | 1.15 A |
| | | | Co-60 | 95.2 ± 5.0<br>106.0 ± 5.6<br>96.6 ± 4.0<br>Mean = 99.3 ± 2.8 | 97.1 ± 1.6 | 1.02 A |
| | | | Co-58 | 73.2 ± 5.8<br>82.6 ± 6.6<br>80.1 ± 4.9<br>Mean = 78.6 ± 3.4 | 77.8 ± 1.3 | 1.01 A |

(1) Results reported as activity ±1 sigma.
(2) Results reported as activity ±1 sigma.
(3) Ratio = Reported/Analytics (See Section 8.3).
(*) Sample provided by Analytics, Inc.
(A) Evaluation Results, Acceptable.

**TABLE D-5 (cont)**
**INTERLABORATORY INTERCOMPARISON PROGRAM**
**Gamma Analysis of Air Particulate Filters (pCi/liter)**

| DATE | JAF ENV ID NO. | MEDIUM | ANALYSIS | JAF RESULT (1) | REFERENCE LAB* (2) | RATIO (3) |
|---|---|---|---|---|---|---|
| 9/15/05 | E-4714-05 | FILTER pCi/liter | Ce-141 | 174.0 ± 4.8<br>173.0 ± 4.8<br>187.0 ± 5.8<br>170.0 ± 4.4<br>Mean = 176.0 ± 2.5 | 165 ± 2.8 | 1.07 A |
| | | | Cr-51 | 239.0 ± 22.1<br>246.0 ± 22.3<br>230.0 ± 24.5<br>232.0 ± 20.7<br>Mean = 236.8 ± 11.2 | 239 ± 4.0 | 0.99 A |
| | | | Cs-134 | 90.4 ± 5.2<br>93.2 ± 5.2<br>110.0 ± 6.6<br>84.7 ± 4.9<br>Mean = 94.6 ± 2.8 | 86.3 ± 1.4 | 1.10 A |
| | | | Cs-137 | 143.0 ± 5.7<br>144.0 ± 5.5<br>139.0 ± 6.6<br>150.0 ± 5.3<br>Mean = 144.0 ± 2.9 | 138 ± 2.3 | 1.04 A |
| | | | Mn-54 | 75.0 ± 4.4<br>65.4 ± 4.4<br>82.9 ± 5.6<br>84.9 ± 4.5<br>Mean = 77.1 ± 2.4 | 65.0 ± 1.1 | 1.19 A |
| | | | Fe-59 | 50.6 ± 5.2<br>45.2 ± 4.9<br>53.4 ± 5.8<br>51.2 ± 4.9<br>Mean = 50.1 ± 2.6 | 43.0 ± 0.7 | 1.17 A |
| | | | Zn-65 | 93.6 ± 9.3<br>110.0 ± 9.0<br>118.0 ± 10.8<br>93.3 ± 8.5<br>Mean = 103.7 ± 4.7 | 87.2 ± 1.5 | 1.19 A |
| | | | Co-60 | 119.0 ± 4.5<br>113.0 ± 4.5<br>133.0 ± 5.8<br>114.0 ± 4.3<br>Mean = 119.8 ± 2.4 | 118 ± 2.0 | 1.01 A |
| | | | Co-58 | 47.8 ± 3.9<br>44.3 ± 3.9<br>39.1 ± 4.5<br>47.3 ± 3.8<br>Mean = 44.6 ± 2.0 | 44.7 ± 0.8 | 1.00 A |

(1) Results reported as activity ±1 sigma.
(2) Results reported as activity ±1 sigma.
(3) Ratio = Reported/Analytics (See Section 8.3).
(*) Sample provided by Analytics, Inc.
(A) Evaluation Results, Acceptable

**TABLE D-5 (cont)**
**INTERLABORATORY INTERCOMPARISON PROGRAM**
**Gamma Analysis Milk (pCi/liter)**

| DATE | JAF ENV ID NO. | MEDIUM | ANALYSIS | JAF RESULT (1) | REFERENCE LAB* (2) | RATIO (3) |
|---|---|---|---|---|---|---|
| 6/9/05 | E-4584-05 | MILK pCi/liter | Ce-141 | 85.9 ± 8.64<br>112.0 ± 10.6<br>105.0 ± 7.9<br>Mean = 101.0 ± 5.3 | 92.4 ± 1.5 | 1.09 A |
| | | | Cr-51 | 224.0 ± 48.4<br>298.0 ± 61.1<br>350.0 ± 45.5<br>Mean = 290.7 ± 30.1 | 303 ± 5.1 | 0.96 A |
| | | | Cs-134 | 83.0 ± 6.9<br>91.5 ± 9.8<br>97.5 ± 7.3<br>Mean = 90.7 ± 4.7 | 95 ± 1.6 | 0.95 A |
| | | | Cs-137 | 174.0 ± 9.8<br>178.0 ± 10.9<br>175.0 ± 8.5<br>Mean = 175.7 ± 5.7 | 189 ± 3.2 | 0.93 A |
| | | | Mn-54 | 128.0 ± 8.5<br>101.0 ± 9.8<br>124.0 ± 7.8<br>Mean = 117.7 ± 5.0 | 125 ± 2.1 | 0.94 A |
| | | | Fe-59 | 49.5 ± 10.1<br>71.3 ± 11.9<br>63.5 ± 8.3<br>Mean = 61.4 ± 5.9 | 63.9 ± 1.1 | 0.96 A |
| | | | Zn-65 | 121.0 ± 16.6<br>170.0 ± 20.7<br>179.0 ± 15.6<br>Mean = 156.7 ± 10.3 | 155 ± 2.6 | 1.01 A |
| | | | Co-60 | 142.0 ± 7.0<br>128.0 ± 8.3<br>130.0 ± 6.4<br>Mean = 133.3 ± 4.2 | 145 ± 2.4 | 0.92 A |

(1) Results reported as activity ±1 sigma.
(2) Results reported as activity ±1 sigma.
(3) Ratio = Reported/Analytics (See Section 8.3).
(*) Sample provided by Analytics, Inc

(A) Evaluation Results, Acceptable

**TABLE D-5 (cont)**
**INTERLABORATORY INTERCOMPARISON PROGRAM**
**Gamma Analysis Milk (pCi/liter)**

| DATE | JAF ENV ID NO. | MEDIUM | ANALYSIS | JAF RESULT (1) | REFERENCE LAB* (2) | RATIO (3) |
|---|---|---|---|---|---|---|
| 9/15/05 | E-4715-05 | MILK pCi/liter | Ce-141 | 232.0 ± 4.9<br>241.0 ± 8.1<br>237.0 ± 7.6<br>Mean = 236.7 ± 4.1 | 233 ± 3.9 | 1.02 A |
| | | | Cr-51 | 326.0 ± 21.0<br>344.0 ± 35.9<br>314.0 ± 31.4<br>Mean = 328.0 ± 17.4 | 338 ± 5.7 | 0.97 A |
| | | | Cs-134 | 130.0 ± 3.7<br>126.0 ± 5.7<br>120.0 ± 5.6<br>Mean = 125.3 ± 2.9 | 122 ± 2.0 | 1.03 A |
| | | | Cs-137 | 187.0 ± 4.0<br>198.0 ± 7.0<br>194.0 ± 6.3<br>Mean = 193.0 ± 3.4 | 195 ± 3.2 | 0.99 A |
| | | | Mn-54 | 97.2 ± 3.3<br>102.0 ± 5.6<br>102.0 ± 5.1<br>Mean = 100.4 ± 2.8 | 92.0 ± 1.5 | 1.09 A |
| | | | Fe-59 | 65.0 ± 3.7<br>49.9 ± 6.3<br>68.4 ± 6.0<br>Mean = 61.1 ± 3.1 | 61.0 ± 1.0 | 1.00 A |
| | | | Zn-65 | 124.0 ± 6.3<br>147.0 ± 12.3<br>121.0 ± 9.6<br>Mean = 130.7 ± 5.6 | 123 ± 2.1 | 1.07 A |
| | | | Co-60 | 159.0 ± 3.2<br>163.0 ± 5.3<br>169.0 ± 5.0<br>Mean = 163.7 ± 2.6 | 167 ± 2.8 | 0.98 A |
| | | | Co-58 | 55.2 ± 2.8<br>62.6 ± 5.0<br>61.8 ± 4.5<br>Mean = 59.9 ± 2.4 | 63.4 ± 1.1 | 0.94 A |

(1) Results reported as activity ±1 sigma.
(2) Results reported as activity ±1 sigma.
(3) Ratio = Reported/Analytics (See Section 8.3).
(*) Sample provided by Analytics, Inc.
(A) Evaluation Results, Acceptable.

**TABLE D-5 (cont)**
**INTERLABORATORY INTERCOMPARISON PROGRAM**
**Gamma Analysis Soil (pCi/gram)**

| DATE | JAF ENV ID NO. | MEDIUM | ANALYSIS | JAF RESULT (1) | REFERENCE LAB* (2) | RATIO (3) |
|---|---|---|---|---|---|---|
| 6/9/05 | E-4585-05 | SOIL pCi/gram | Ce-141 | 0.203 ± 0.022<br>0.157 ± 0.022<br>0.190 ± 0.024<br>0.171 ± 0.037<br>Mean = 0.173 ± 0.017 | 0.182 ± 0.003 | 0.95 A |
| | | | Cr-51 | 0.356 ± 0.101<br>0.593 ± 0.122<br>0.697 ± 0.135<br>0.640 ± 0.198<br>Mean = 0.643 ± 0.090 | 0.596 ± 0.010 | 1.08 A |
| | | | Cs-134 | 0.160 ± 0.015<br>0.204 ± 0.016<br>0.193 ± 0.018<br>0.182 ± 0.008<br>Mean = 0.193 ± 0.009 | 0.187 ± 0.003 | 1.03 A |
| | | | Cs-137 | 0.449 ± 0.021<br>0.480 ± 0.023<br>0.479 ± 0.027<br>0.473 ± 0.010<br>Mean = 0.477 ± 0.012 | 0.474 ± 0.008 | 1.01 A |
| | | | Mn-54 | 0.256 ± 0.018<br>0.255 ± 0.018<br>0.223 ± 0.021<br>0.244 ± 0.009<br>Mean = 0.241 ± 0.010 | 0.246 ± 0.004 | 0.98 A |
| | | | Fe-59 | 0.109 ± 0.025<br>0.104 ± 0.029<br>0.132 ± 0.032<br>0.131 ± 0.031<br>0.157 ± 0.033<br>Mean = 0.127 ± 0.013 | 0.126 ± 0.002 | 1.01 A |
| | | | Zn-65 | 0.320 ± 0.034<br>0.360 ± 0.033<br>0.374 ± 0.040<br>0.320 ± 0.017<br>Mean = 0.351 ± 0.018 | 0.305 ± 0.005 | 1.15 A |
| | | | Co-60 | 0.277 ± 0.014<br>0.266 ± 0.015<br>0.279 ± 0.017<br>0.274 ± 0.007<br>Mean = 0.273 ± 0.008 | 0.285 ± 0.005 | 0.96 A |

(1) Results reported as activity ±1 sigma.
(2) Results reported as activity ±1 sigma.
(3) Ratio = Reported/Analytics (See Section 8.3).
(*) Sample provided by Analytics, Inc.
(A) Evaluation Results, Acceptable.

**TABLE D-5 (cont)**
**INTERLABORATORY INTERCOMPARISON PROGRAM**
**Gamma Analysis Vegetation (pCi/gram)**

| DATE | JAF ENV ID NO. | MEDIUM | ANALYSIS | JAF RESULT (1) | REFERENCE LAB* (2) | RATIO (3) |
|---|---|---|---|---|---|---|
| 6/9/05 | E-4587-05 | VEGETATION pCi/gram | Ce-141 | 0.179 ± 0.012<br>0.160 ± 0.012<br>0.193 ± 0.012<br>0.180 ± 0.015<br>Mean = 0.178 ± 0.009 | 0.174 ± 0.003 | 1.02 A |
| | | | Cr-51 | 0.600 ± 0.087<br>0.464 ± 0.075<br>0.470 ± 0.059<br>0.638 ± 0.118<br>Mean = 0.543 ± 0.058 | 0.569 ± 0.010 | 0.95 A |
| | | | Cs-134 | 0.232 ± 0.013<br>0.213 ± 0.013<br>0.197 ± 0.010<br>0.195 ± 0.006<br>Mean = 0.209 ± 0.007 | 0.179 ± 0.003 | 1.17 A |
| | | | Cs-137 | 0.370 ± 0.015<br>0.340 ± 0.015<br>0.341 ± 0.012<br>0.326 ± 0.007<br>Mean = 0.344 ± 0.008 | 0.355 ± 0.006 | 0.97 A |
| | | | Mn-54 | 0.243 ± 0.014<br>0.227 ± 0.014<br>0.238 ± 0.011<br>0.235 ± 0.006<br>Mean = 0.236 ± 0.008 | 0.235 ± 0.004 | 1.00 A |
| | | | Fe-59 | 0.123 ± 0.015<br>0.112 ± 0.016<br>0.139 ± 0.012<br>0.123 ± 0.014<br>Mean = 0.124 ± 0.009 | 0.120 ± 0.002 | 1.04 A |
| | | | Zn-65 | 0.275 ± 0.023<br>0.280 ± 0.029<br>0.301 ± 0.019<br>0.317 ± 0.013<br>Mean = 0.293 ± 0.014 | 0.292 ± 0.005 | 1.00 A |
| | | | Co-60 | 0.273 ± 0.011<br>0.252 ± 0.011<br>0.267 ± 0.009<br>0.271 ± 0.005<br>Mean = 0.266 ± 0.006 | 0.272 ± 0.005 | 0.98 A |

(1) Results reported as activity ±1 sigma.
(2) Results reported as activity ±1 sigma.
(3) Ratio = Reported/Analytics (See Section 8.3).
(*) Sample provided by Analytics, Inc.
(A) Evaluation Results, Acceptable.

**TABLE D-5 (cont)**
**INTERLABORATORY INTERCOMPARISON PROGRAM**
**Gross Beta Analysis of Water (pCi/ml)**

| DATE | JAF ENV ID NO. | MEDIUM | ANALYSIS | JAF RESULT (1) | REFERENCE LAB* (2) | RATIO (3) |
|---|---|---|---|---|---|---|
| 11/11/05 | A19773-05 | WATER pCi/ml | GROSS BETA | 1908 ± 2<br>1687 ± 2<br>1908 ± 2<br>1706 ± 2<br>Mean = 1802 ± 2 | 1830 ± 46 | 0.98 A |

(1) Results reported as activity ±1 sigma.
(2) Results reported as activity ±1 sigma.
(3) Ratio = Reported/known
(*) Sample provided by Analytics, Inc.
(A) Evaluation Results, Acceptable.

**TABLE D-5 (Continued)**
**INTERLABORATORY INTERCOMPARISON PROGRAM**
**Gamma Analysis of NIST Filter and water samples**

| DATE | JAF ENV ID NO. | MEDIUM | ANALYSIS | JAF RESULT (1) | REFERENCE LAB* (2) | RATIO (3) |
|---|---|---|---|---|---|---|
| 8/20005 | 1801-20 | FILTER pCi/filter | Ce-141 | 1.86E5 ± 791<br>1.85E5 ± 887<br>1.96E5 ± 785<br>Mean = 1.89E5 ± 475 | 1.96E5 ± 2176 | 0.96 A |
| | | | Ba-133 | 5.25E4 ± 277<br>5.36E4 ± 300<br>5.21E4 ± 262<br>Mean = 5.27E4 ± 162 | 5.95E4 ± 619 | 0.89 A |
| | | | Cs-134 | 2.90E4 ± 230<br>2.30E4 ± 226<br>2.95E4 ± 224<br>Mean = 2.72E4 ± 131 | 2.79E4 ± 254 | 0.97 A |
| | | | Fe-59 | 1.99E5 ± 1140<br>1.94E5 ± 1460<br>2.03E5 ± 1110<br>Mean = 1.99E5 ± 720 | 1.87E5 ± 1982 | 1.06 A |
| | | | Zn-65 | 9.59E4 ± 686<br>9.30E4 ± 878<br>9.76E4 ± 664<br>Mean = 9.55E4 ± 432 | 9.02E4 ± 1344 | 1.06 A |
| 8/2005 | 1800-10 | WATER pCi/g | Ce-141 | 1.48E5 ± 752<br>1.46E5 ± 686<br>1.47E5 ± 845<br>Mean = 1.47E5 ± 441 | 1.48E5 ± 1125 | 0.99 A |
| | | | Ba-133 | 4.17E4 ± 193<br>4.22E4 ± 188<br>4.27E4 ± 237<br>Mean = 4.22E4 ± 120 | 4.41E4 ± 291 | 0.96 A |
| | | | Cs-134 | 2.69E4 ± 170<br>2.69E4 ± 166<br>2.74E4 ± 208<br>Mean = 2.71E4 ± 105 | 2.62E4 ± 115 | 1.03 A |
| | | | Fe-59 | 1.21E5 ± 685<br>1.22E5 ± 687<br>1.22E5 ± 871<br>Mean = 1.22E5 ± 435 | 1.18E5 ± 814 | 1.03 A |
| | | | Zn-65 | 6.16E4 ± 426<br>6.12E4 ± 423<br>6.13E4 ± 535<br>Mean = 6.14E4 ± 268 | 5.91E4 ± 745 | 1.04 A |

(1) Results reported as activity ±1 sigma.
(1) Results reported as activity ±2 sigma (total propagated uncertainty).
(3) Ratio = Reported/NIST (see Section 8.3).
(*) Sample provided by NIST.
(A) Evaluation Results, Acceptable.

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